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A 23-year-old woman comes to the physician because of a 4-week history of a whistling noise during respiration. She underwent a difficult rhinoplasty a few months ago. The noise is getting louder and is annoying. Which of the following is the most likely diagnosis?

- ☐ A. Nasal septal perforation
- ☐ B. Nasal polyp
- ☐ C. Nasal foreign body
- ☐ D. Allergic rhinitis
- ☐ E. Nasal furunculosis

Submit

A 23-year-old woman comes to the physician because of a 4-week history of a whistling noise during respiration. She underwent a difficult rhinoplasty a few months ago. The noise is getting louder and is annoying. Which of the following is the most likely diagnosis?

✓ ☒ A. Nasal septal perforation (74%)

☐ B. Nasal polyp (11%)

☐ C. Nasal foreign body (5%)

☐ D. Allergic rhinitis (0%)

☐ E. Nasal furunculosis (7%)

Omitted

Correct answer
A

74%
Answered correctly

02 secs
Time Spent

02/25/2020
Last Updated

Explanation

Complications are common following rhinoplasty, and up to one in four rhinoplasties may need revision. Common complications include patient dissatisfaction, nasal obstruction and epistaxis. Those that involve the nasal septum are less common but more serious. The septum is made up of cartilage and has poor blood supply contrasting sharply with the rich anastomosing blood supply of the nasal sidewall. The underlying cartilage relies completely on the overlying mucosa for nourishment by diffusion. Because of the poor regenerating capacity of the septal cartilage, trauma or surgery on the septum may result in septal perforation. The typical postoperative presentation is a whistling noise heard during respiration. Following nasal surgery, septal perforation is typically the result of a septal hematoma though a septal abscess may also be the cause. Additional conditions that can cause septal perforation are self-inflicted trauma (nose picking), syphilis, tuberculosis, intranasal cocaine use, sarcoidosis and

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Complications are common following rhinoplasty, and up to one in four rhinoplasties may need revision. Common complications include patient dissatisfaction, nasal obstruction and epistaxis. Those that involve the nasal septum are less common but more serious. The septum is made up of cartilage and has poor blood supply contrasting sharply with the rich anastomosing blood supply of the nasal sidewall. The underlying cartilage relies completely on the overlying mucosa for nourishment by diffusion. Because of the poor regenerating capacity of the septal cartilage, trauma or surgery on the septum may result in septal perforation. The typical postoperative presentation is a whistling noise heard during respiration. Following nasal surgery, septal perforation is typically the result of a septal hematoma though a septal abscess may also be the cause. Additional conditions that can cause septal perforation are self-inflicted trauma (nose picking), syphilis, tuberculosis, intranasal cocaine use, sarcoidosis and granulomatosis with polyangiitis (Wegener's).

(Choice B) Nasal polyps are usually seen in patients with asthma and allergic disorders but may also occur in patients with other inflammatory conditions of the nasal mucosa. They may cause chronic nasal obstruction and should be surgically removed in symptomatic patients.

(Choice C) Foreign bodies are common in children. On presentation, patients will have nasal obstruction and may have a foul odor, halitosis and nasal bleeding. Following surgery, a retained foreign body such as nasal packing most classically would cause toxic shock syndrome.

(Choice D) Allergic rhinitis commonly presents with rhinorrhea, nasal pruritus, cough and occasionally dyspnea. On examination, the nasal mucosa is edematous and pale, and polyps may be present.

(Choice E) Nasal furunculosis results from staphylococcal folliculitis following nose picking or nasal hair plucking. It is potentially life threatening as it can spread to the cavernous sinus. Patients complain of pain, tenderness and erythema in the nasal vestibule.

Educational objective:

If a patient develops a whistling noise during respiration following rhinoplasty, one should suspect nasal septal perforation likely resulting from a septal hematoma.

Surgery

Subject

Ear, Nose & Throat (ENT)

System

Deviated nasal septum

Topic

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Question Id: 16448



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Settings

A 56-year-old man comes to the emergency department with right leg swelling. He noticed the swelling yesterday and has not had injury to that leg or a recent fall. The patient has no chronic medical conditions and takes no medications. On review of systems, he endorses frequent nosebleeds and occasional gum bleeding, which began recently. He has also had persistent, nagging epigastric and back pain. The patient has lost 4.5 kg (10 lb) over the past 3 months despite no change in diet or activities. He has smoked a pack of cigarettes daily for 30 years. The patient does not use alcohol or illicit drugs. Temperature is 36.9 C (98.4 F), blood pressure is 110/80 mm Hg, pulse is 96/min, and respirations are 16/min. Chest examination is unremarkable. Mild epigastric tenderness is present. There is moderate, asymmetric right lower extremity edema. Peripheral pulses are full and symmetric. Further evaluation is most likely to reveal which of the following?

- ☐ A. Antiphospholipid antibodies
- ☐ B. Consumptive coagulopathy
- ☐ C. Cryoglobulinemia
- ☐ D. Inherited activated protein C resistance
- ☐ E. Thromboangiitis obliterans

Submit



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A 56-year-old man comes to the emergency department with right leg swelling. He noticed the swelling yesterday and has not had injury to that leg or a recent fall. The patient has no chronic medical conditions and takes no medications. On review of systems, he endorses frequent nosebleeds and occasional gum bleeding, which began recently. He has also had persistent, nagging epigastric and back pain. The patient has lost 4.5 kg (10 lb) over the past 3 months despite no change in diet or activities. He has smoked a pack of cigarettes daily for 30 years. The patient does not use alcohol or illicit drugs. Temperature is 36.9 C (98.4 F), blood pressure is 110/80 mm Hg, pulse is 96/min, and respirations are 16/min. Chest examination is unremarkable. Mild epigastric tenderness is present. There is moderate, asymmetric right lower extremity edema. Peripheral pulses are full and symmetric. Further evaluation is most likely to reveal which of the following?

- ☐ A. Antiphospholipid antibodies (4%)
- ☒ B. Consumptive coagulopathy (42%)
- ☐ C. Cryoglobulinemia (20%)
- ☐ D. Inherited activated protein C resistance (6%)
- ☐ E. Thromboangiitis obliterans (25%)

Omitted
Correct answer
B

42%
Answered correctly

02 secs
Time Spent

04/08/2020
Last Updated

Explanation

Acute vs chronic disseminated intravascular coagulation (DIC)		

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Acute vs chronic disseminated intravascular coagulation (DIC)		
	Acute DIC	Chronic DIC
Common etiologies	Sepsis Severe trauma Obstetric complications	Malignancy (eg, pancreatic)
Coagulation studies	Prolonged	Often normal
Platelets	Low	Often normal
Fibrinogen	Low	Often normal
D-dimer	High	High
Bleeding risk	Very high	Mildly increased
Thromboembolism risk	Mildly increased	Very high

In this patient with asymmetric leg swelling suggestive of deep venous thrombosis (DVT), several features are concerning for **chronic disseminated intravascular coagulation** (DIC) in the setting of cancer. His long history of smoking combined with unintentional weight loss and nagging epigastric and back pain raises suspicion for **pancreatic cancer**. Mucin-producing tumors (eg, pancreatic, gastric, ovarian, breast) often secrete tissue factor into the blood, which **intermittently** triggers the coagulation cascade and can lead to chronic DIC, a **consumptive coagulopathy**.

As with other consumptive coagulopathies, the risk of arterial or **venous thrombosis** (eg, **DVT**) is significantly increased in patients with chronic DIC; in addition, periodic **mucocutaneous bleeding** (eg, gums, nose) can occur, as seen in this patient. However, because patients with chronic DIC are usually able to compensate for intermittent coagulation and fibrinolysis via increased production of coagulation factors, platelets, and fibrinogen, they may be asymptomatic and frequently have normal platelet counts and coagulation times.

In contrast to chronic DIC, acute DIC usually arises in the setting of sustained procoagulant exposure (eg, lipopolysaccharide in sepsis) and is

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In this patient with asymmetric leg swelling suggestive of deep venous thrombosis (DVT), several features are concerning for **chronic disseminated intravascular coagulation** (DIC) in the setting of cancer. His long history of smoking combined with unintentional weight loss and nagging epigastric and back pain raises suspicion for **pancreatic cancer**. Mucin-producing tumors (eg, pancreatic, gastric, ovarian, breast) often secrete tissue factor into the blood, which **intermittently** triggers the coagulation cascade and can lead to chronic DIC, a **consumptive coagulopathy**.

As with other consumptive coagulopathies, the risk of arterial or **venous thrombosis** (eg, **DVT**) is significantly increased in patients with chronic DIC; in addition, periodic **mucocutaneous bleeding** (eg, gums, nose) can occur, as seen in this patient. However, because patients with chronic DIC are usually able to compensate for intermittent coagulation and fibrinolysis via increased production of coagulation factors, platelets, and fibrinogen, they may be asymptomatic and frequently have normal platelet counts and coagulation times.

In contrast to chronic DIC, acute DIC usually arises in the setting of sustained procoagulant exposure (eg, lipopolysaccharide in sepsis) and is marked by massive activation of the coagulation cascade, with rapid consumption of platelets, coagulation factors, and fibrinogen. Most cases present with acute bleeding rather than thrombosis.

(Choice A) Antiphospholipid antibodies increase the risk of venous thromboembolism and fetal loss. Bleeding risk is not generally increased. In addition, antiphospholipid antibodies are most often associated with systemic lupus erythematosus, not pancreatic cancer.

(Choice C) Cryoglobulinemia, a small- to medium-sized vessel vasculitis caused by the precipitation of circulating antibodies, is most common in the setting of infection (eg, hepatitis C), monoclonal gammopathy (eg, multiple myeloma), or connective tissue disease. Patients generally have palpable purpura, weakness, renal insufficiency, and arthritis/arthralgias. Thrombosis and bleeding are atypical, and the condition is not typically linked to pancreatic cancer.

(Choice D) Factor V Leiden is a disorder marked by an inherited resistance to activated protein C. Because protein C is an anticoagulant, patients are at increased risk for thromboembolism. However, bleeding risk is not increased, and the condition is not associated with pancreatic cancer.

(Choice E) Thromboangiitis obliterans is a small- and medium-sized vessel vasculitis of the extremities that typically occurs in young patients who smoke. It generally causes distal extremity ischemia, digit ulcers, and/or digit gangrene. This older patient with epigastric pain, unintentional weight loss, and evidence of both bleeding and thrombosis is more likely to have chronic DIC due to cancer.

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As with other consumptive coagulopathies, the risk of arterial or **venous thrombosis** (eg, **DVT**) is significantly increased in patients with chronic DIC; in addition, periodic **mucocutaneous bleeding** (eg, gums, nose) can occur, as seen in this patient. However, because patients with chronic DIC are usually able to compensate for intermittent coagulation and fibrinolysis via increased production of coagulation factors, platelets, and fibrinogen, they may be asymptomatic and frequently have normal platelet counts and coagulation times.

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Educational objective:

Chronic disseminated intravascular coagulation is common in patients with mucin-producing tumors (eg, pancreatic cancer) due to periodic release of tissue factor into the bloodstream, which triggers low-grade coagulation and fibrinolysis. Patients frequently have normal platelet counts and coagulation times but are at increased risk for venous and arterial thrombosis and, to a lesser extent, mucocutaneous bleeding.

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Surgery

Hematology & Oncology

DIC

Subject

System

Topic

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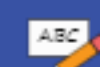
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Settings

A 73-year-old man with dementia is brought to the emergency department by nursing home staff because he has been moaning continuously and gripping his lower abdomen for the past 36 hours. The patient is unable to give any history, but staff members say that he refused oral intake the previous day. He has had no vomiting or diarrhea. His last bowel movement was 2 days ago. The patient uses adult diapers, which were last changed 2 days ago. He has a history of benign prostatic hyperplasia, external hemorrhoids, hypertension, and hyperlipidemia. One year ago, he was hospitalized for diverticular bleeding that resolved spontaneously. His medications review shows that his primary care physician started amitriptyline 8 days ago for chronic neck pain. On physical examination, the patient is afebrile. His blood pressure is 160/70 mm Hg and his pulse is 100/min. The mucous membranes are moist. His lung fields are clear to auscultation. Palpation of the abdomen shows fullness and tenderness along the midline below the umbilicus without guarding or rigidity. Bowel sounds are heard in all 4 quadrants. Which of the following is the best initial management for this patient?

- ☐ A. Abdominal CT scan
- ☐ B. Barium enema
- ☐ C. Intravenous fluids, analgesics, and observation
- ☐ D. Upright abdominal x-ray
- ☐ E. Urgent surgical consultation
- ☐ F. Urinary catheterization

Submit



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Feedback



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A 73-year-old man with dementia is brought to the emergency department by nursing home staff because he has been moaning continuously and gripping his lower abdomen for the past 36 hours. The patient is unable to give any history, but staff members say that he refused oral intake the previous day. He has had no vomiting or diarrhea. His last bowel movement was 2 days ago. The patient uses adult diapers, which were last changed 2 days ago. He has a history of benign prostatic hyperplasia, external hemorrhoids, hypertension, and hyperlipidemia. One year ago, he was hospitalized for diverticular bleeding that resolved spontaneously. His medications review shows that his primary care physician started amitriptyline 8 days ago for chronic neck pain. On physical examination, the patient is afebrile. His blood pressure is 160/70 mm Hg and his pulse is 100/min. The mucous membranes are moist. His lung fields are clear to auscultation. Palpation of the abdomen shows fullness and tenderness along the midline below the umbilicus without guarding or rigidity. Bowel sounds are heard in all 4 quadrants. Which of the following is the best initial management for this patient?

- ☐ A. Abdominal CT scan (10%)
- ☐ B. Barium enema (2%)
- ☐ C. Intravenous fluids, analgesics, and observation (5%)
- ☐ D. Upright abdominal x-ray (17%)
- ☐ E. Urgent surgical consultation (1%)
- ☒ F. Urinary catheterization (62%)

Omitted
Correct answer
F

62%
Answered correctly

02 secs
Time Spent

05/10/2020
Last Updated

Explanation

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Explanation

This patient's abdominal pain and suprapubic fullness are consistent with amitriptyline-induced urinary retention. Amitriptyline is a tricyclic antidepressant with anticholinergic properties. The bladder empties under muscarinic control with both detrusor muscle contraction and internal urethral sphincter relaxation. Anticholinergic agents can cause urinary retention by reducing detrusor contraction and preventing urethral sphincter relaxation. In addition, elderly male patients often have some degree of underlying benign prostatic hyperplasia and are at risk for urinary retention. Both the anticholinergic properties of amitriptyline and pressure from urinary retention could have caused this patient's constipation as well.

This patient's clinical presentation is sufficient to initiate prompt urinary catheterization for suspected urinary retention. Bedside ultrasound or bladder scan (if available) can also help in diagnosis but should not delay urinary catheterization. Urinary catheterization can document a postvoid residual bladder volume (>50 mL is considered diagnostic for urinary retention) and provides symptomatic relief by draining urine from the distended bladder. This patient should also discontinue amitriptyline therapy.

(Choice A) An abdominal CT scan would reveal a distended bladder in this patient and may also show hydronephrosis and hydroureter. However, CT scans are more expensive and time-consuming than urinary catheterization and will not provide symptomatic relief.

(Choice B) Barium enemas are used to diagnose luminal abnormalities of the colon, such as colon cancer or diverticulosis.

(Choice C) Intravenous fluids, analgesics, and observation are the treatment for nephrolithiasis (kidney stones). Patients with kidney stones typically present with intense flank pain and hematuria instead of suprapubic fullness. Intravenous fluids could potentially worsen this patient's obstructive urinary symptoms.

(Choice D) Upright abdominal x-ray is not as reliable for evaluating urinary retention as it may not show a distended bladder (unless obstructed by a bladder stone). Abdominal x-rays are more useful for diagnosing ileus or small-bowel obstruction. Amitriptyline may cause ileus, but these patients typically develop nausea, vomiting, hypoactive bowel sounds, distended abdomen, diffuse mild abdominal pain, and abdominal imaging showing dilated bowel loops without air/fluid levels. This patient's normal bowel sounds, infraumbilical fullness, and lack of wet diapers for 2 days make urinary retention more likely than ileus.

(Choice E) Surgical consultation is indicated for suspected acute abdomen (eg, bowel perforation, mechanical obstruction). Obstruction typically presents with vomiting, moderate to severe abdominal pain, hyperactive bowel sounds, possible peritoneal signs (eg, guarding), and dilated bowel

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well.

This patient's clinical presentation is sufficient to initiate prompt urinary catheterization for suspected urinary retention. Bedside ultrasound or bladder scan (if available) can also help in diagnosis but should not delay urinary catheterization. Urinary catheterization can document a postvoid residual bladder volume (>50 mL is considered diagnostic for urinary retention) and provides symptomatic relief by draining urine from the distended bladder. This patient should also discontinue amitriptyline therapy.

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(Choice E) Surgical consultation is indicated for suspected acute abdomen (eg, bowel perforation, mechanical obstruction). Obstruction typically presents with vomiting, moderate-to-severe abdominal pain, hyperactive bowel sounds, possible peritoneal signs (eg, guarding), and dilated bowel loops with air fluid levels on imaging. Perforation usually has absent bowel sounds. This patient's absence of guarding/rigidity or gastrointestinal symptoms (eg, vomiting) makes these less likely.

Educational objective:

Drugs with anticholinergic properties can cause acute urinary retention by preventing detrusor muscle contraction and urinary sphincter relaxation. The treatment involves urinary catheterization and discontinuing the medication.

References

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A 23-year-old man comes to the clinic for evaluation of a rash. He reports that reddish bumps began to develop on his shins 4 weeks ago. Although painful, they are not itchy. On review of systems, he notes that his stools have become looser than normal over the past 6 months and are associated with intermittent, crampy abdominal pain. He has unintentionally lost 5 kg (11 lb) in the past month. The patient has no hematochezia, nausea, vomiting, joint pains, night sweats, or fevers. Medical and family history are unremarkable. He does not use tobacco, alcohol, or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 113/72 mm Hg, pulse is 85/min, and respirations are 15/min. Physical examination reveals several 2- to 3-cm erythematous, tender, nonmobile nodules on the anterior aspect of both lower extremities. Careful skin examination reveals no other abnormalities. The abdomen is mildly tender to palpation but without distension, rebound, or guarding. Which of the following most likely explains this patient's presentation?

- ☐ A. *Campylobacter jejuni* infection
- ☐ B. Celiac disease
- ☐ C. Colon cancer
- ☐ D. IgA vasculitis
- ☐ E. Inflammatory bowel disease

Submit

A 23-year-old man comes to the clinic for evaluation of a rash. He reports that reddish bumps began to develop on his shins 4 weeks ago. Although painful, they are not itchy. On review of systems, he notes that his stools have become looser than normal over the past 6 months and are associated with intermittent, crampy abdominal pain. He has unintentionally lost 5 kg (11 lb) in the past month. The patient has no hematochezia, nausea, vomiting, joint pains, night sweats, or fevers. Medical and family history are unremarkable. He does not use tobacco, alcohol, or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 113/72 mm Hg, pulse is 85/min, and respirations are 15/min. Physical examination reveals several 2- to 3-cm erythematous, tender, nonmobile nodules on the anterior aspect of both lower extremities. Careful skin examination reveals no other abnormalities. The abdomen is mildly tender to palpation but without distension, rebound, or guarding. Which of the following most likely explains this patient's presentation?

- ☐ A. *Campylobacter jejuni* infection (0%)
- ☐ B. Celiac disease (27%)
- ☐ C. Colon cancer (0%)
- ☐ D. IgA vasculitis (4%)
- ☒ E. Inflammatory bowel disease (66%)

Omitted

Correct answer
E

66% Answered correctly

01 sec Time Spent

02/09/2020 Last Updated

Explanation

This patient likely has **erythema nodosum** (EN) (eg, painful, erythematous nodules on his shins) in the setting of uncontrolled **inflammatory bowel disease** (IBD) (eg, chronic diarrhea, abdominal pain, weight loss). The association between EN and IBD is well recognized and more

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This patient likely has **erythema nodosum** (EN) (eg, painful, erythematous nodules on his shins) in the setting of uncontrolled **inflammatory bowel disease** (IBD) (eg, chronic diarrhea, abdominal pain, weight loss). The association between EN and IBD is well recognized and more commonly occurs in **Crohn disease** than ulcerative colitis. EN mirrors IBD disease activity, meaning that it worsens during severe IBD flares and resolves as those flares improve.

EN presents as **tender, nonpruritic, erythematous**, or **violaceous nodules** that typically measure 2-3 cm in size. The nodules are usually located on the **shins** but can develop elsewhere on the legs or on the upper extremities, buttocks, trunk, or face. EN results from a **delayed-type hypersensitivity reaction** to antigen exposure. Biopsy of the nodules reveals **septal panniculitis** without vasculitis.

In addition to IBD, EN has other important disease associations, including sarcoidosis, malignancy (eg, Hodgkin lymphoma), and certain infections (eg, streptococcal, endemic fungal, viral mononucleosis).

(Choice A) *Campylobacter jejuni* typically causes a self-limited gastroenteritis with diarrhea (bloody or non-bloody) that resolves within approximately 7 days. Although the organism has been reported to trigger EN, it more commonly causes reactive arthritis or Guillain-Barré syndrome.

(Choice B) Celiac disease is associated with dermatitis herpetiformis, which presents with itchy papules and vesicles that are most prominent on the elbows and forearms. This patient's rash is inconsistent with dermatitis herpetiformis because it is nodular, nonitchy, and most prominent on the shins.

(Choice C) Migratory superficial thrombophlebitis (eg, Trousseau syndrome) can be seen with adenocarcinoma of the colon, pancreas, or stomach. It usually presents with recurrent, tender nodules that appear on different parts of the body at different times. Because the nodules in this patient appeared simultaneously and only on the shins, Trousseau syndrome due to underlying malignancy is unlikely.

(Choice D) IgA vasculitis, formerly called Henoch-Schoenlein purpura, presents most commonly in children with palpable purpura, joint pain, abdominal pain, and renal disease; chronic diarrhea is not a prominent symptom.

Educational objective:

Erythema nodosum presents with tender, nonpruritic, erythematous, or violaceous nodules measuring 2-3 cm and usually located on the shins. It has a strong association with inflammatory bowel disease (IBD), especially Crohn disease, and its presence correlates with the degree of IBD

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EN presents as **tender, nonpruritic, erythematous, or violaceous nodules** that typically measure 2-3 cm in size. The nodules are usually located on the **shins** but can develop elsewhere on the legs or on the upper extremities, buttocks, trunk, or face. EN results from a **delayed-type hypersensitivity reaction** to antigen exposure. Biopsy of the nodules reveals **septal panniculitis** without vasculitis.

In addition to IBD, EN has other important disease associations, including sarcoidosis, malignancy (eg, Hodgkin lymphoma), and certain infections (eg, streptococcal, endemic fungal, viral mononucleosis).

(Choice A) *Campylobacter jejuni* typically causes a self-limited gastroenteritis with diarrhea (bloody or non-bloody) that resolves within approximately 7 days. Although the organism has been reported to trigger EN, it more commonly causes reactive arthritis or Guillain-Barré syndrome.

(Choice B) Celiac disease is associated with dermatitis herpetiformis, which presents with itchy papules and vesicles that are most prominent on the elbows and forearms. This patient's rash is inconsistent with dermatitis herpetiformis because it is nodular, nonitchy, and most prominent on the shins.

(Choice C) Migratory superficial thrombophlebitis (eg, Trousseau syndrome) can be seen with adenocarcinoma of the colon, pancreas, or stomach. It usually presents with recurrent, tender nodules that appear on different parts of the body at different times. Because the nodules in this patient appeared simultaneously and only on the shins, Trousseau syndrome due to underlying malignancy is unlikely.

(Choice D) IgA vasculitis, formerly called Henoch-Schoenlein purpura, presents most commonly in children with palpable purpura, joint pain, abdominal pain, and renal disease; chronic diarrhea is not a prominent symptom.

Educational objective:

Erythema nodosum presents with tender, nonpruritic, erythematous, or violaceous nodules measuring 2-3 cm and usually located on the shins. It has a strong association with inflammatory bowel disease (IBD), especially Crohn disease, and its presence correlates with the degree of IBD activity.

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Gastrointestinal & Nutrition

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Settings

A 21-year-old man is evaluated in the postoperative recovery unit due to worsening shortness of breath. The patient was brought to the emergency department 24 hours ago after an all-terrain vehicle rolled on top of him. He has had no significant medical problems and takes no medications. The patient frequently binge-drinks alcohol and was drinking just prior to the incident. He was found to have a right femoral midshaft fracture and right foot metatarsal fractures. The patient underwent intramedullary nailing of the femoral fracture and has received intravenous fluids and blood transfusion. Cast immobilization of the metatarsal fractures was also performed. Temperature is 37.7 C (99.9 F), blood pressure is 130/80 mm Hg, pulse is 120/min, and respirations are 24/min. Pulse oximetry shows 84% on room air. The patient is restless, agitated, and confused. He has scattered petechiae on the trunk, but there are no chest wall ecchymoses. Breath sounds are normal and equal in both lungs. Cardiac auscultation is normal with the exception of tachycardia. Abdomen is soft and nondistended. Lower extremity examination shows postoperative changes. Urgent chest x-ray reveals no pneumothorax and clear lung fields. Which of the following is the most likely cause of this patient's current condition?

- ☐ A. Blood transfusion-related pulmonary capillary damage
- ☐ B. Fat globules entering the bloodstream
- ☐ C. Postoperative partial lung collapse
- ☐ D. Pulmonary edema due to myocardial dysfunction
- ☐ E. Sudden decrease in the blood alcohol level
- ☐ F. Thromboembolic occlusion of the pulmonary arteries
- ☐ G. Traumatic contusion of the pulmonary parenchyma

Submit



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A 21-year-old man is evaluated in the postoperative recovery unit due to worsening shortness of breath. The patient was brought to the emergency department 24 hours ago after an all-terrain vehicle rolled on top of him. He has had no significant medical problems and takes no medications. The patient frequently binge-drinks alcohol and was drinking just prior to the incident. He was found to have a right femoral midshaft fracture and right foot metatarsal fractures. The patient underwent intramedullary nailing of the femoral fracture and has received intravenous fluids and blood transfusion. Cast immobilization of the metatarsal fractures was also performed. Temperature is 37.7 C (99.9 F), blood pressure is 130/80 mm Hg, pulse is 120/min, and respirations are 24/min. Pulse oximetry shows 84% on room air. The patient is restless, agitated, and confused. He has scattered petechiae on the trunk, but there are no chest wall ecchymoses. Breath sounds are normal and equal in both lungs. Cardiac auscultation is normal with the exception of tachycardia. Abdomen is soft and nondistended. Lower extremity examination shows postoperative changes. Urgent chest x-ray reveals no pneumothorax and clear lung fields. Which of the following is the most likely cause of this patient's current condition?

- ☐ A. Blood transfusion-related pulmonary capillary damage (2%)
- ☒ B. Fat globules entering the bloodstream (85%)
- ☐ C. Postoperative partial lung collapse (0%)
- ☐ D. Pulmonary edema due to myocardial dysfunction (0%)
- ☐ E. Sudden decrease in the blood alcohol level (4%)
- ☐ F. Thromboembolic occlusion of the pulmonary arteries (5%)
- ☐ G. Traumatic contusion of the pulmonary parenchyma (1%)

Omitted
Correct answer
B

85%
Answered correctly

02 secs
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Fat embolism syndrome	
Etiology	• Fracture of marrow-containing bone (eg, femur) • Orthopedic surgery • Pancreatitis
Clinical presentation	• 24-72 hours following inciting event • Clinical triad ◦ Respiratory distress ◦ Neurologic dysfunction (eg, confusion) ◦ Petechial rash
Diagnosis	• Based on clinical presentation
Prevention & treatment	• Early immobilization of fracture • Supportive care (eg, mechanical ventilation)

This patient most likely has **fat embolism syndrome (FES)**. The mechanism of FES is not completely understood, but it is postulated that fat enters the venous circulation following an inciting event (eg, femur fracture) and causes mechanical disruption of capillary blood flow (fat microemboli may be small enough to pass through the pulmonary circulation to the systemic circulation) or leads to a systemic inflammatory response through the production of toxic intermediaries. Patients classically have a triad of severe **respiratory distress** (eg, hypoxemia, dyspnea, tachypnea, tachycardia), which can mimic acute respiratory distress syndrome (ARDS); **neurologic dysfunction** (eg, confusion, visual field defects); and a **petechial rash** (present in up to half of cases). Low-grade fever and subconjunctival hemorrhage may also be present. Chest x-ray is typically unremarkable at the time of symptom onset but reveals bilateral pulmonary infiltrates within 24-48 hours.

The diagnosis of FES is based on compatible **clinical presentation**. Treatment is supportive; approximately half of patients with FES due to long bone fracture require mechanical ventilation. Death can occur, but the majority of patients make a full recovery.

(Choice A) Blood transfusion-related pulmonary capillary damage describes transfusion-related acute lung injury (TRALI). Patients typically

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This patient most likely has **fat embolism syndrome (FES)**. The mechanism of FES is not completely understood, but it is postulated that fat enters the venous circulation following an inciting event (eg, femur fracture) and causes mechanical disruption of capillary blood flow (fat microemboli may be small enough to pass through the pulmonary circulation to the systemic circulation) or leads to a systemic inflammatory response through the production of toxic intermediaries. Patients classically have a triad of severe **respiratory distress** (eg, hypoxemia, dyspnea, tachypnea, tachycardia), which can mimic acute respiratory distress syndrome (ARDS); **neurologic dysfunction** (eg, confusion, visual field defects); and a **petechial rash** (present in up to half of cases). Low-grade fever and subconjunctival hemorrhage may also be present. Chest x-ray is typically unremarkable at the time of symptom onset but reveals bilateral pulmonary infiltrates within 24-48 hours.

The diagnosis of FES is based on compatible **clinical presentation**. Treatment is supportive; approximately half of patients with FES due to long bone fracture require mechanical ventilation. Death can occur, but the majority of patients make a full recovery.

(Choice A) Blood transfusion-related pulmonary capillary damage describes transfusion-related acute lung injury (TRALI). Patients typically demonstrate respiratory distress, but crackles should be present on lung auscultation and chest x-ray should reveal bilateral infiltrates (due to pulmonary edema) at symptom onset.

(Choice C) Postoperative partial lung collapse (atelectasis) may lead to respiratory distress and hypoxemia; however, it is ruled out by chest x-ray revealing clear lung fields.

(Choices D and G) Chest trauma can lead to myocardial or pulmonary contusion, both of which typically manifest with respiratory distress due to pulmonary edema. Absence of external evidence of chest trauma (eg, ecchymosis) and a clear chest x-ray make these diagnoses unlikely.

(Choice E) A marked decrease in blood alcohol level can lead to alcohol withdrawal in patients with chronic alcohol abuse. Patients typically present with agitation, tachycardia, confusion, and/or hallucinations within 24-48 hours of hospital arrival. Marked hypoxemia and a petechial rash are not typical.

(Choice F) Thromboembolic occlusion of the pulmonary arteries describes pulmonary thromboembolism. Patients often present with respiratory distress; however, the presence of a petechial rash makes FES more likely.

Educational objective:

Fat embolism syndrome can occur following fracture of large, marrow-containing bones (eg, femur, pelvis). Patients classically have the triad of

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Chest x-ray is typically unremarkable at the time of symptom onset but reveals bilateral pulmonary infiltrates within 24-48 hours.

The diagnosis of FES is based on compatible **clinical presentation**. Treatment is supportive; approximately half of patients with FES due to long bone fracture require mechanical ventilation. Death can occur, but the majority of patients make a full recovery.

(Choice A) Blood transfusion-related pulmonary capillary damage describes transfusion-related acute lung injury (TRALI). Patients typically demonstrate respiratory distress, but crackles should be present on lung auscultation and chest x-ray should reveal bilateral infiltrates (due to pulmonary edema) at symptom onset.

(Choice C) Postoperative partial lung collapse (atelectasis) may lead to respiratory distress and hypoxemia; however, it is ruled out by chest x-ray revealing clear lung fields.

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(Choice E) A marked decrease in blood alcohol level can lead to alcohol withdrawal in patients with chronic alcohol abuse. Patients typically present with agitation, tachycardia, confusion, and/or hallucinations within 24-48 hours of hospital arrival. Marked hypoxemia and a petechial rash are not typical.

(Choice F) Thromboembolic occlusion of the pulmonary arteries describes pulmonary thromboembolism. Patients often present with respiratory distress; however, the presence of a petechial rash makes FES more likely.

Educational objective:

Fat embolism syndrome can occur following fracture of large, marrow-containing bones (eg, femur, pelvis). Patients classically have the triad of respiratory distress, neurologic dysfunction, and petechial rash.

References

- [Fat embolism syndrome.](#)

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Settings

A 24-year-old woman comes to the urgent care center due to increasing pain in her right leg. She initially felt a dull, aching pain at the anterior aspect of the lower leg 2 weeks ago. The patient is an avid dancer and often practices 4-5 hours a day; the pain has worsened and is now interfering with her dance sessions. Her medical history is remarkable for irregular, light menstrual periods, for which she is being evaluated by her gynecologist. The patient drinks alcohol only on social occasions and does not smoke or use illicit drugs. Temperature is 36.7 C (98 F), blood pressure is 122/78 mm Hg, and pulse is 70/min. BMI is 16 kg/m². Examination shows point tenderness over the anterior aspect of the right shin. There are no skin abnormalities, and the rest of the physical examination is unremarkable. An x-ray of the lower leg reveals no abnormalities. Which of the following is the most likely diagnosis?

- ☐ A. Compartment syndrome
- ☐ B. Interosseous ligament tear
- ☐ C. Nerve entrapment
- ☐ D. Osteoid osteoma
- ☐ E. Shin splints
- ☐ F. Stress fracture

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A 24-year-old woman comes to the urgent care center due to increasing pain in her right leg. She initially felt a dull, aching pain at the anterior aspect of the lower leg 2 weeks ago. The patient is an avid dancer and often practices 4-5 hours a day; the pain has worsened and is now interfering with her dance sessions. Her medical history is remarkable for irregular, light menstrual periods, for which she is being evaluated by her gynecologist. The patient drinks alcohol only on social occasions and does not smoke or use illicit drugs. Temperature is 36.7 C (98 F), blood pressure is 122/78 mm Hg, and pulse is 70/min. BMI is 16 kg/m². Examination shows point tenderness over the anterior aspect of the right shin. There are no skin abnormalities, and the rest of the physical examination is unremarkable. An x-ray of the lower leg reveals no abnormalities. Which of the following is the most likely diagnosis?

- ☐ A. Compartment syndrome (1%)
- ☐ B. Interosseous ligament tear (3%)
- ☐ C. Nerve entrapment (1%)
- ☐ D. Osteoid osteoma (1%)
- ☐ E. Shin splints (34%)
- ☒ F. Stress fracture (58%)

Omitted

Correct answer
F

58%
Answered correctly

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Time Spent

04/17/2020
Last Updated

Explanation

Stress fracture	
Risk factors	• Repetitive activities (eg, running, gymnastics) • Abrupt increase in physical activity • Inadequate calcium & vitamin D intake • Decreased caloric intake • Female athlete triad: low caloric intake, hypomenorrhea/amenorrhea, low bone density
Clinical presentation	• Insidious onset of localized pain • Point tenderness at fracture site • Possible negative x-ray in the first 6 weeks
Management	• Reduced weight bearing for 4-6 weeks • Referral to orthopedic surgeon for fracture at high risk for malunion (eg, anterior tibial cortex, 5th metatarsal)

This patient has subacute leg pain consistent with a **tibial stress fracture**, which most commonly occurs in athletes (eg, runners, dancers) or other individuals who suddenly increase their activity level. These types of fractures are caused by repeated tension or compression without adequate rest, and are especially common in women who have low bone density associated with low caloric intake and hypomenorrhea/amenorrhea (**female athlete triad**). Other factors contributing to stress fractures include improper footwear, biomechanical abnormalities (eg, weak calf muscles, high-arched feet), and inadequate calcium and vitamin D intake.

In addition to the tibia, stress fractures can also be seen in the metatarsals, tarsal bones (eg, navicular, calcaneus), and, less commonly, the femur and pelvis. The diagnosis is based primarily on clinical factors, including localized **activity-related pain**, swelling, and **point tenderness** on palpation. X-rays are frequently normal (especially in the first few weeks) but may reveal periosteal reaction at the site of the fracture. MRI and bone scan are more sensitive but not usually necessary.

(Choice A) Chronic exertional compartment syndrome is caused by increased pressure within a muscle group during exercise. It is typically seen

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This patient has subacute leg pain consistent with a **tibial stress fracture**, which most commonly occurs in athletes (eg, runners, dancers) or other individuals who suddenly increase their activity level. These types of fractures are caused by repeated tension or compression without adequate rest, and are especially common in women who have low bone density associated with low caloric intake and hypomenorrhea/amenorrhea (**female athlete triad**). Other factors contributing to stress fractures include improper footwear, biomechanical abnormalities (eg, weak calf muscles, high-arched feet), and inadequate calcium and vitamin D intake.

In addition to the tibia, stress fractures can also be seen in the metatarsals, tarsal bones (eg, navicular, calcaneus), and, less commonly, the femur and pelvis. The diagnosis is based primarily on clinical factors, including localized **activity-related pain**, swelling, and **point tenderness** on palpation. X-rays are frequently normal (especially in the first few weeks) but may reveal periosteal reaction at the site of the fracture. MRI and bone scan are more sensitive but not usually necessary.

(Choice A) Chronic exertional compartment syndrome is caused by increased pressure within a muscle group during exercise. It is typically seen in young athletes but would not cause point tenderness on the bone.

(Choice B) Injury to the interosseous ligaments (high ankle sprain) presents with acute anterolateral ankle pain, typically following rotational force on a dorsiflexed ankle. Patients frequently have an associated fibular fracture.

(Choice C) Nerve entrapment presents with radiating pain and is not reproducible with local palpation.

(Choice D) Osteoid osteoma is a benign bone-forming tumor of the femur and other long bones that occurs in adolescence and early adulthood. Focal tenderness is common, but the pain is not activity related, and x-rays will reveal areas of lucency with sclerotic margins.

(Choice E) Medial tibial stress syndrome (shin splints) causes anterior leg pain resembling that of a stress fracture. It is usually seen in casual runners and is characterized by a diffuse area of tenderness (not point tenderness, as seen in this patient). Shin splints are more common in overweight than underweight individuals.

Educational objective:

Tibial stress fractures are caused by repeated tension or compression without adequate rest and occur most commonly in athletes or others who suddenly increase their activity. Findings include subacute, localized, activity-related pain; swelling; and point tenderness on palpation. X-rays are frequently normal.

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and pain. The diagnosis is based primarily on clinical factors, including localized activity-related pain, swelling, and point tenderness on palpation. X-rays are frequently normal (especially in the first few weeks) but may reveal periosteal reaction at the site of the fracture. MRI and bone scan are more sensitive but not usually necessary.

(Choice A) Chronic exertional compartment syndrome is caused by increased pressure within a muscle group during exercise. It is typically seen in young athletes but would not cause point tenderness on the bone.

(Choice B) Injury to the interosseous ligaments (high ankle sprain) presents with acute anterolateral ankle pain, typically following rotational force on a dorsiflexed ankle. Patients frequently have an associated fibular fracture.

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(Choice D) Osteoid osteoma is a benign bone-forming tumor of the femur and other long bones that occurs in adolescence and early adulthood. Focal tenderness is common, but the pain is not activity related, and x-rays will reveal areas of lucency with sclerotic margins.

(Choice E) Medial tibial stress syndrome (shin splints) causes anterior leg pain resembling that of a stress fracture. It is usually seen in casual runners and is characterized by a diffuse area of tenderness (not point tenderness, as seen in this patient). Shin splints are more common in overweight than underweight individuals.

Educational objective:

Tibial stress fractures are caused by repeated tension or compression without adequate rest and occur most commonly in athletes or others who suddenly increase their activity. Findings include subacute, localized, activity-related pain; swelling; and point tenderness on palpation. X-rays are frequently normal.

References

- [Stress fractures: pathophysiology, clinical presentation, imaging features, and treatment options.](#)

Surgery

Rheumatology/Orthopedics & Sports

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Settings

A 38-year-old woman comes to the office for evaluation of pain and tingling in her hands. She works as a telemarketer for a local sales and marketing agency and has been having difficulty holding the phone. Review of systems is positive for frequent muscle aches in her arms and legs, constipation, lethargy, and difficulty concentrating at work. The patient has no other medical problems and takes no medication. She does not use tobacco, alcohol, or illicit drugs. Blood pressure is 130/80 mm Hg, pulse is 70/min, and respirations are 14/min. BMI is 32 kg/m². On examination, there is numbness in the thumb, index, and middle fingers of both hands. Deep tendon reflexes are 1+ in all 4 extremities. The skin appears doughy and dry at both elbows. Mild edema is present in both ankles. Which of the following is most likely responsible for this patient's hand symptoms?

- ☐ A. Amyloid accumulation
- ☐ B. Calcium phosphate deposits
- ☐ C. Mucinous infiltration
- ☐ D. Periventricular demyelination
- ☐ E. Vascular steal phenomenon

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A 38-year-old woman comes to the office for evaluation of pain and tingling in her hands. She works as a telemarketer for a local sales and marketing agency and has been having difficulty holding the phone. Review of systems is positive for frequent muscle aches in her arms and legs, constipation, lethargy, and difficulty concentrating at work. The patient has no other medical problems and takes no medication. She does not use tobacco, alcohol, or illicit drugs. Blood pressure is 130/80 mm Hg, pulse is 70/min, and respirations are 14/min. BMI is 32 kg/m². On examination, there is numbness in the thumb, index, and middle fingers of both hands. Deep tendon reflexes are 1+ in all 4 extremities. The skin appears doughy and dry at both elbows. Mild edema is present in both ankles. Which of the following is most likely responsible for this patient's hand symptoms?

- ☐ A. Amyloid accumulation (31%)
- ☐ B. Calcium phosphate deposits (13%)
- ☒ C. Mucinous infiltration (38%)
- ☐ D. Periventricular demyelination (10%)
- ☐ E. Vascular steal phenomenon (4%)

Omitted

 38%
Correct answer
C Answered correctly

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 06/23/2020
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Explanation

Pathophysiology of carpal tunnel syndrome	

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HD - hemodialysis.

This patient has myalgias, constipation, impaired concentration, dry skin, mild edema, and hyporeflexia, suggesting **hypothyroidism**. She also has pain, paresthesia, and sensory loss in the distribution of the median nerve, findings consistent with **carpal tunnel syndrome** (CTS). CTS is an entrapment mononeuropathy caused by compression of the median nerve within the [carpal tunnel](#) in the wrist.

In addition to slowed metabolic activity, many symptoms of hypothyroidism (eg, myxedema, dry skin) are due to deposition of mucinous material composed of glycosaminoglycans, hyaluronans, and mucopolysaccharides within tissue. **Direct infiltration of the median nerve** and nerve sheath with **mucinous material** results in swelling and a localized ischemic neuropathy. Deposition on the tendons within the carpal tunnel results in swelling and compression on the nerve, leading to symptoms of CTS.

Patients with hypothyroidism are more likely to develop bilateral CTS, and their symptoms may be more severe. The risk does not appear to correlate with the severity of the underlying thyroid disease, although it is greater in patients with elevated BMI. Treatment of hypothyroidism with levothyroxine often leads to improvement of CTS symptoms.

(Choices A, B, and E) Patients with end-stage renal disease (ESRD) on hemodialysis frequently develop CTS due to accumulation of dialysis-related amyloid. When CTS occurs, it is more common in the arm used for vascular access (eg, access graft, arteriovenous fistula), suggesting a contribution of vascular steal or venous hypertension. ESRD can also lead to pathologic calcification with deposition of calcium phosphate, which can compress the nerve. However, these factors are unlikely in this patient.

(Choice D) Multiple sclerosis is characterized by demyelination in the periventricular white matter; common manifestations include weakness, sensory loss, incontinence, and optic neuropathy. However, symptoms are episodic and affect multiple, noncontiguous domains; symptoms involving the distribution of the median nerve in the hand are more consistent with CTS.

Educational objective:

Carpal tunnel syndrome is common in patients with hypothyroidism and is frequently bilateral. Hypothyroidism causes soft tissue thickening and mucinous infiltration, which can lead to compression of the median nerve within the carpal tunnel.

References

- [Carpal tunnel syndrome in hypothyroidism.](#)

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In addition to slowed metabolic activity, many symptoms of hypothyroidism (eg, myxedema, dry skin) are due to deposition of mucinous material composed of glycosaminoglycans, hyaluronans, and mucopolysaccharides within tissue. **Direct infiltration of the median nerve** and nerve sheath with **mucinous material** results in swelling and a localized ischemic neuropathy. Deposition on the tendons within the carpal tunnel results in swelling and compression on the nerve, leading to symptoms of CTS.

Patients with hypothyroidism are more likely to develop bilateral CTS, and their symptoms may be more severe. The risk does not appear to correlate with the severity of the underlying thyroid disease, although it is greater in patients with elevated BMI. Treatment of hypothyroidism with levothyroxine often leads to improvement of CTS symptoms.

(Choices A, B, and E) Patients with end-stage renal disease (ESRD) on hemodialysis frequently develop CTS due to accumulation of dialysis-related amyloid. When CTS occurs, it is more common in the arm used for vascular access (eg, access graft, arteriovenous fistula), suggesting a contribution of vascular steal or venous hypertension. ESRD can also lead to pathologic calcification with deposition of calcium phosphate, which can compress the nerve. However, these factors are unlikely in this patient.

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Educational objective:

Carpal tunnel syndrome is common in patients with hypothyroidism and is frequently bilateral. Hypothyroidism causes soft tissue thickening and mucinous infiltration, which can lead to compression of the median nerve within the carpal tunnel.

References

- [Carpal tunnel syndrome in hypothyroidism.](#)

Surgery

Nervous System

Carpal tunnel syndrome

Subject

System

Topic

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TUTOR

4

Feedback

Suspend

End Block

	Pregnancy	Edema/Fluid accumulation
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Exhibit Display

Transverse cross section of wrist & carpal tunnel

Labels:

- Palmaris longus tendon
- Median nerve
- Flexor pollicis longus tendon
- Thenar muscles
- Flexor carpi radialis tendon
- Trapezium
- Extensor pollicis brevis
- Extensor pollicis longus
- Radial artery
- Extensor carpi radialis longus
- Extensor carpi radialis brevis
- Trapezoid
- Tendons of extensor digitorum & indicis
- Capitate
- Extensor digiti minimi
- Extensor carpi ulnaris
- Hamate
- Flexor digitorum profundus tendons
- Flexor digitorum superficialis tendons
- Synovial sheath
- Hypothenar muscles
- Ulnar nerve
- Ulnar artery
- Flexor retinaculum

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sensory loss, incontinence, and optic neuropathy. However, symptoms are episodic and affect multiple, noncontiguous domains, symptoms

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A 26-year-old, previously healthy man comes to the emergency department due to an eye injury. The patient was hiking earlier today when the person in front of him pushed and let go of a small tree branch, which snapped back and hit him on the face. He had sudden pain in the right eye followed by a persistent foreign-body sensation and increased tearing. On physical examination, the patient appears in moderate distress. Right eye examination reveals no foreign bodies, but there is mild conjunctival erythema, especially around the limbus. The cornea is clear with no blood in the anterior chamber. The pupil is small, round, and reactive to light. Visual acuity is normal. Left eye examination reveals no abnormalities. Which of the following is the best next step in management of this patient?

- ☐ A. Continuous saline irrigation
- ☐ B. CT scan of the orbits
- ☐ C. Fluorescein staining
- ☐ D. Ocular tonometry
- ☐ E. Topical glucocorticoid

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- ☐ A. Continuous saline irrigation (25%)
- ☐ B. CT scan of the orbits (4%)
- ☒ C. Fluorescein staining (63%)
- ☐ D. Ocular tonometry (3%)
- ☐ E. Topical glucocorticoid (2%)

Omitted

Correct answer
C

63%
Answered correctly

02 secs
Time Spent

03/22/2020
Last Updated

Explanation

This patient sustained a high-velocity eye injury with persistent pain, tearing, and foreign body sensation. **High-velocity injury** to the globe carries a significant risk of **corneal abrasion** and open globe laceration (OGL). A large OGL may present with globe deformity, extrusion of vitreous or iris, or visible entry wound. However, smaller lacerations and abrasions may not be visible on routine inspection. Depending on the mechanism of injury, small particulate matter (eg, metal shards, glass fragments) can occasionally penetrate the globe, leading to a retained

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Question Id: 4015

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This patient sustained a high-velocity eye injury with persistent pain, tearing, and foreign body sensation. **High-velocity injury** to the globe carries a significant risk of **corneal abrasion** and open globe laceration (OGL). A large OGL may present with globe deformity, extrusion of vitreous or iris, or visible entry wound. However, smaller lacerations and abrasions may not be visible on routine inspection. Depending on the mechanism of injury, small particulate matter (eg, metal shards, glass fragments) can occasionally penetrate the globe, leading to a retained foreign body.

Further assessment of ocular injury can be obtained with **fluorescein drops**; as aqueous humor drains through an OGL site, fluorescein may be seen streaming away from the site or clear fluid may be seen flowing through the fluorescein. In the case of corneal abrasion, fluorescein instillation in the eye preferentially stains the corneal defect and appears yellow (an ophthalmoscope with a cobalt blue filter can facilitate visualization if needed).

(Choice A) Saline irrigation can be used to clear a superficial foreign body but should not be performed unless OGL has been ruled out and a foreign body identified.

(Choice B) CT scan is used to diagnose orbital fractures, which commonly cause diplopia, pain on lateral gaze, ecchymosis, stepoff, or crepitus, none of which are seen in this patient. CT scan is unlikely to identify a corneal abrasion, and fluorescein staining should be performed first.

(Choice D) Ocular tonometry is used primarily to identify elevated intraocular pressure associated with glaucoma. If there is concern for OGL, tonometry is typically avoided as it can cause further extrusion of aqueous and vitreous humor.

(Choice E) Ocular glucocorticoids are used for certain inflammatory conditions (eg, uveitis) but would likely slow healing in a patient with a high-velocity injury and may predispose to infection or corneal perforation.

Educational objective:

High-velocity injury to the globe can lead to corneal abrasion or open globe laceration (OGL). Small injuries may not be visible on routine inspection, but further assessment can be obtained with fluorescein instillation. In OGL, fluorescein may reveal extrusion of fluid through the laceration; in corneal abrasion, fluorescein stains the corneal defect and appears yellow.

Surgery

Ophthalmology

Ocular trauma

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(Choice D) Ocular tonometry is used primarily to identify elevated intraocular pressure associated with glaucoma. If there is concern for OGL, tonometry is typically avoided as it can cause further extrusion of aqueous and vitreous humor.

(Choice E) Ocular glucocorticoids are used for certain inflammatory conditions (eg, uveitis) but would likely slow healing in a patient with a high-velocity injury and may predispose to infection or corneal perforation.

Educational objective:

High-velocity injury to the globe can lead to corneal abrasion or open globe laceration (OGL). Small injuries may not be visible on routine inspection, but further assessment can be obtained with fluorescein instillation. In OGL, fluorescein may reveal extrusion of fluid through the laceration; in corneal abrasion, fluorescein stains the corneal defect and appears yellow.

Surgery

Ophthalmology

Ocular trauma

Subject

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A 55-year-old man is brought to the emergency department due to a gunshot wound to the left abdomen. He undergoes an exploratory laparotomy involving a partial small bowel resection and a left nephrectomy. His postoperative hemoglobin is 10.4 mg/dL. The patient has no other medical history and takes no medications. Recovery is uneventful until postoperative day 4 when he develops fever, tachypnea, and shortness of breath. The patient is lethargic but responsive. Temperature is 38.9 C (102 F), blood pressure is 75/50 mm Hg, pulse is 110/min and regular, and respirations are 22/min. There is no jugular venous distention. Lung auscultation reveals crackles at the right lung base. There are no cardiac murmurs. Abdominal examination shows a well-healing abdominal wound and a soft, nondistended abdomen. His urine output over the last 12 hours is 100 mL. Laboratory results are as follows:

Complete blood count

Hemoglobin	9.6 g/dL
Leukocytes	17,000/mm ³

Serum chemistry

Bicarbonate	15 mEq/L
Blood urea nitrogen	24 mg/dL
Creatinine	1.2 mg/dL

Liver function studies

Albumin	2.8 g/dL
---------	----------

Arterial blood gases

pH	7.28
PaO ₂	64 mm Hg

	Serum chemistry	
	Bicarbonate	15 mEq/L
	Blood urea nitrogen	24 mg/dL
	Creatinine	1.2 mg/dL
	Liver function studies	
	Albumin	2.8 g/dL
	Arterial blood gases	
	pH	7.28
	PaO ₂	64 mm Hg
	PaCO ₂	32 mm Hg

Broad-spectrum antibiotics are started. Which of the following additional treatments is the most appropriate next step in management of this patient?

- ☐ A. Hemodialysis
- ☐ B. Intravenous 0.9% saline
- ☐ C. Intravenous albumin infusion
- ☐ D. Intravenous dopamine
- ☐ E. Intravenous hydrocortisone

	Liver function studies	
	Albumin	2.8 g/dL
	Arterial blood gases	
	pH	7.28
	PaO ₂	64 mm Hg
	PaCO ₂	32 mm Hg

Broad-spectrum antibiotics are started. Which of the following additional treatments is the most appropriate next step in management of this patient?

- ☐ A. Hemodialysis
- ☐ B. Intravenous 0.9% saline
- ☐ C. Intravenous albumin infusion
- ☐ D. Intravenous dopamine
- ☐ E. Intravenous hydrocortisone
- ☐ F. Intravenous sodium bicarbonate
- ☐ G. Red blood cell transfusion

Submit

Liver function studies

Albumin 2.8 g/dL

Arterial blood gases

pH 7.28

PaO₂ 64 mm Hg

PaCO₂ 32 mm Hg

Broad-spectrum antibiotics are started. Which of the following additional treatments is the most appropriate next step in management of this patient?

- ☐ A. Hemodialysis (4%)
- ✓ ☒ B. Intravenous 0.9% saline (73%)
- ☐ C. Intravenous albumin infusion (4%)
- ☐ D. Intravenous dopamine (3%)
- ☐ E. Intravenous hydrocortisone (1%)
- ☐ F. Intravenous sodium bicarbonate (10%)
- ☐ G. Red blood cell transfusion (2%)

Omitted

Correct answer



73%
Answered correctly



05 secs
Time Spent



03/30/2020
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Explanation

This patient has likely developed pneumonia and has signs of **septic shock**, including fever, tachycardia, hypotension, and poor urine output. After securing an airway, if needed, the goals in managing septic shock include **restoring adequate tissue perfusion** and **identifying the underlying infection** and treating it appropriately. Crystalloid solution (eg, normal saline, Ringer's lactate) is the fluid of choice to restore volume quickly as it is as effective as albumin in terms of survival but is less costly and easier to acquire (**Choice C**).

Crystalloid should be given as **intravenous boluses** (500-1000 mL) to improve systolic blood pressure >90 mm Hg, at which perfusion is considered adequate. This is continued with close monitoring for evidence of volume overload (eg, pulmonary edema, hypoxia) or until fluid no longer improves the blood pressure. If the patient fails to respond or develops evidence of volume overload without improvement in blood pressure, then vasopressors (eg, norepinephrine) should be started to improve perfusion (**Choice D**).

This patient's arterial blood gas is suggestive of a compensated metabolic acidosis (likely lactic acidosis due to organ hypoperfusion); therefore, it would be reasonable to administer isotonic saline without concern about worsening the acidosis.

(Choice A) Despite this patient's poor urine output in the past 12 hours, there is no current indication for hemodialysis as he first should be given a fluid challenge through boluses to see if urine output improves. In addition, this patient has a compensated metabolic acidosis, no major electrolytes abnormalities, no uremia, and no volume overload, which are indications to start urgent hemodialysis.

(Choice E) Intravenous hydrocortisone can be used in septic shock but is generally started in patients who do not respond to volume resuscitation and the initiation of vasopressors.

(Choice F) This patient has a compensated metabolic acidosis despite a pH of 7.28. The use of bicarbonate is not clearly indicated unless there is a severe acute acidosis (pH <7.2).

(Choice G) Generally, even in patients with septic shock, the goal of transfusion is to keep the hemoglobin >7 g/dL unless they have not responded to crystalloid and vasopressors. This patient has a hemoglobin of 9.6 g/dL and no current clear indication (eg, active bleeding) for a red blood cell transfusion.

Educational objective:

Patients with septic shock first require aggressive volume resuscitation with intravenous 0.9% saline prior to the initiation of vasopressors to

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Question Id: 12457



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Settings

A 42-year-old man comes to the emergency department due to worsening anal pain for the past 2 days. The patient initially had pain only during defecation, but now the pain is constant and severe. He also has anal pruritus but has not had any drainage. The patient reports a history of constipation with hard stools every 3-4 days requiring the frequent use of laxatives. He has had sexual intercourse with men and women and has had anoreceptive intercourse in the past. Temperature is 38 C (100.4 F), blood pressure is 120/80 mm Hg, and pulse is 85/min. Physical examination shows an erythematous and tender 1-cm fluctuant mass near the anal orifice with induration of the overlying skin. Which of the following is the most likely cause of this patient's current condition?

- ☐ A. Human papillomavirus infection of the anal canal
- ☐ B. Infection of an occluded anal crypt gland
- ☐ C. Overstretching and tearing of the anal mucosa
- ☐ D. Prolapse of an internal hemorrhoid
- ☐ E. Thrombosis of an external hemorrhoid

Submit



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Feedback



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A 42-year-old man comes to the emergency department due to worsening anal pain for the past 2 days. The patient initially had pain only during defecation, but now the pain is constant and severe. He also has anal pruritus but has not had any drainage. The patient reports a history of constipation with hard stools every 3-4 days requiring the frequent use of laxatives. He has had sexual intercourse with men and women and has had anoreceptive intercourse in the past. Temperature is 38 C (100.4 F), blood pressure is 120/80 mm Hg, and pulse is 85/min. Physical examination shows an erythematous and tender 1-cm fluctuant mass near the anal orifice with induration of the overlying skin. Which of the following is the most likely cause of this patient's current condition?

- ☐ A. Human papillomavirus infection of the anal canal (12%)
- ☒ B. Infection of an occluded anal crypt gland (47%)
- ☐ C. Overstretching and tearing of the anal mucosa (9%)
- ☐ D. Prolapse of an internal hemorrhoid (5%)
- ☐ E. Thrombosis of an external hemorrhoid (25%)

Omitted

Correct answer B

47% Answered correctly

01 sec Time Spent

06/14/2020 Last Updated

Explanation

This patient has an indurated, erythematous mass near the anal orifice associated with severe, constant anal pain and a low-grade fever, which is consistent with a **perianal abscess**. A perianal abscess is due to **occlusion** of an **anal crypt gland**, which allows for **bacterial infection**. Abscesses can form relatively **acutely** following gland obstruction due to the high levels of bacteria in the area. Risk factors for abscess development include anoreceptive intercourse and constipation, among others. Initially, a perianal abscess may cause pain only with defecation.

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Untreated perianal abscesses often progress to form **anorectal fistulae**, communications between the abscess and perirectal skin or nearby organs. Early recognition followed by **incision and drainage** is essential to avoid such progression.

(Choice A) Human papillomavirus can be transmitted via anoreceptive intercourse and result in anogenital warts ([condylomata acuminata](#)). Most warts are asymptomatic papules. Unlike this patient's lesions, they are rarely associated with pain and usually not associated with fever.

(Choice C) Anal fissures are the result of overstretching and tearing of the anal mucosa, usually from rectal pressure and local trauma. Tearing pain is associated with bowel movements, and small amounts of hematochezia when wiping may be noted. Fevers, fluctuant mass, and constant pain are not generally associated with anal fissures.

(Choices D and E) Internal [hemorrhoids](#) originate above the dentate line and can prolapse through the anal canal; they are often associated with painless rectal bleeding. External hemorrhoids originate below the dentate line; thrombosis can cause the surrounding skin to become inflamed and edematous, resulting in exquisite pain and tenderness. However, association with a fluctuant mass or fever is unusual for hemorrhoids.

Educational objective:

Occlusion of an anal crypt gland can lead to a bacterial infection and perianal abscess formation. Perianal abscesses often present as tender, fluctuant, erythematous masses with fever and progressively worsening pain. Anoreceptive intercourse and chronic constipation are among the risk factors for perianal abscess development.

References

- [Anorectal infection: abscess-fistula.](#)

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References

- [Anorectal infection: abscess-fistula.](#)

Surgery

Gastrointestinal & Nutrition

Perianal abscess

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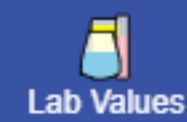
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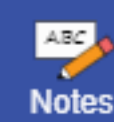
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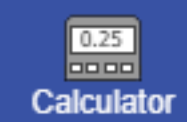
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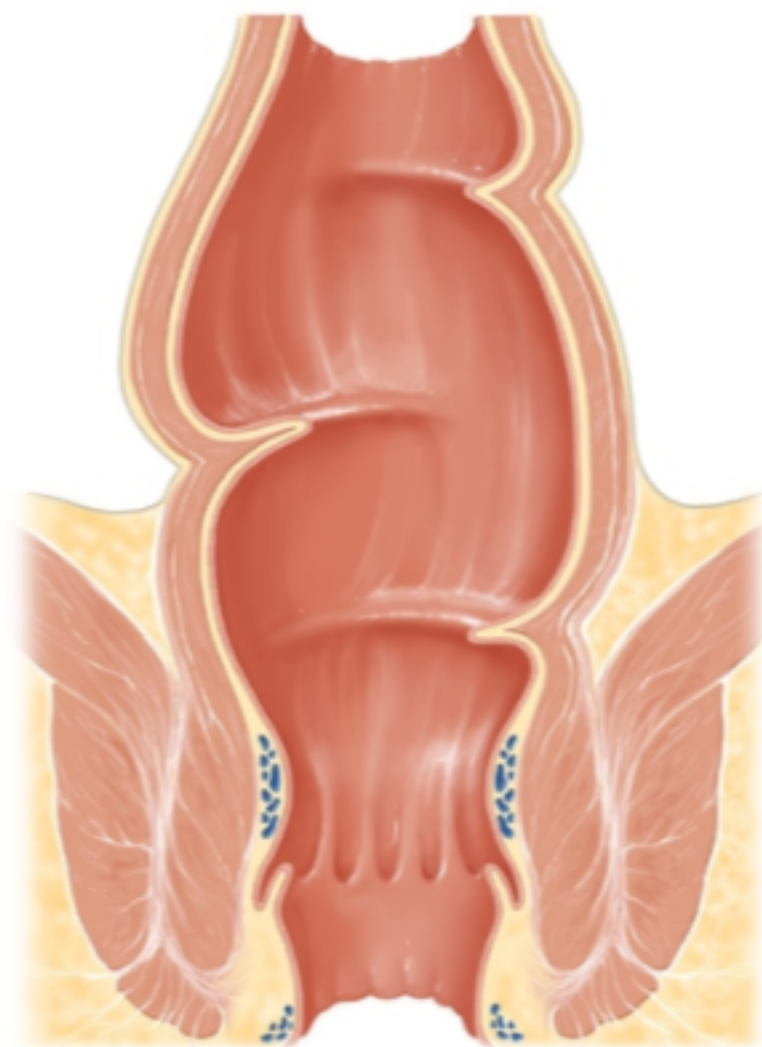


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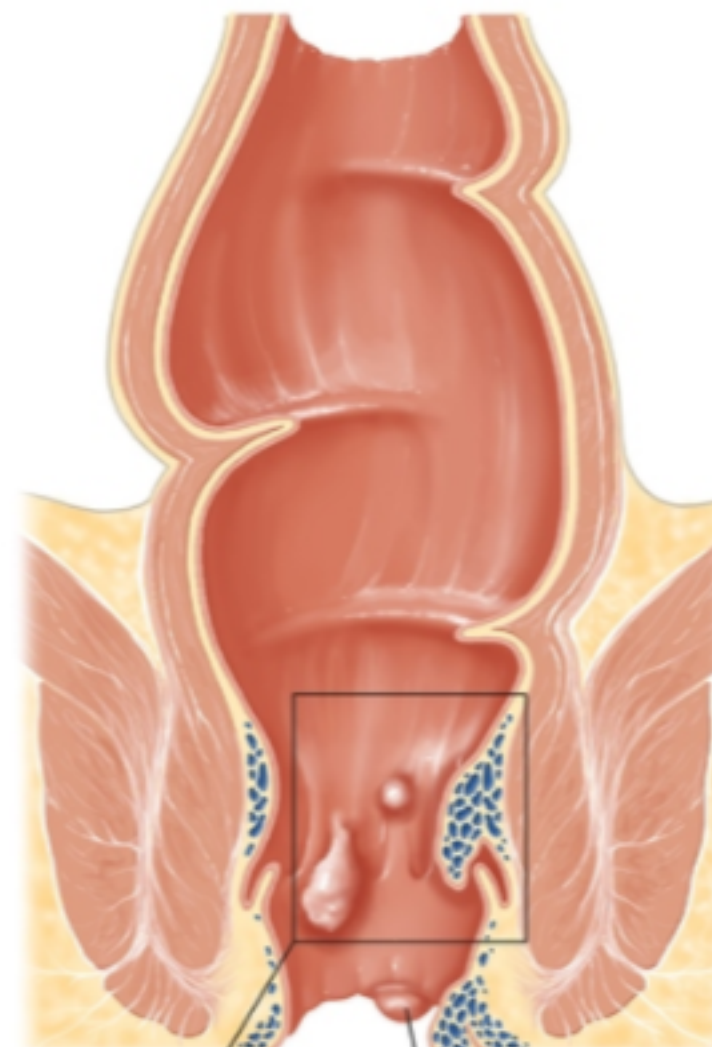
Explanation

Exhibit Display

Normal venous plexus



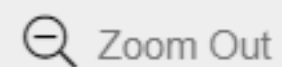
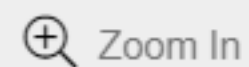
Hemorrhoids



Internal hemorrhoids

External hemorrhoids

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A 26-year-old man comes to the emergency department with 4 weeks of intermittent lower abdominal pain and cramps accompanied by rectal urgency, bloody diarrhea, nausea, and decreased appetite. His symptoms have become more severe over the past 2 days. The patient's medical history is unremarkable, and he has had no recent travel or antibiotic use. His temperature is 38.5 C (101.3 F), blood pressure is 90/50 mm Hg, pulse is 130/min, and respiratory rate is 15/min. Abdominal examination reveals distension, diffuse tenderness to palpation, and decreased bowel sounds. There is no rebound tenderness. Rectal examination shows marked tenderness and mucus mixed with blood in the vault. Laboratory results are as follows:

Hemoglobin	10.2 g/dL
Leukocytes	31,600/mm ³
Platelets	459,000/mm ³
Erythrocyte sedimentation rate	54 mm/hr

Intravenous fluids are started, with improvement of blood pressure to 103/58 mm Hg. Which of the following is the most appropriate next step in management of this patient?

- ☐ A. Abdominal x-ray
- ☐ B. Barium enema
- ☐ C. Colonoscopy with biopsies
- ☐ D. Emergent surgery
- ☐ E. Opioid analgesics
- ☐ F. Stool sample for ova and parasites
- ☐ G. Sulfasalazine

pulse is 130/min, and respiratory rate is 15/min. Abdominal examination reveals distension, diffuse tenderness to palpation, and decreased bowel sounds. There is no rebound tenderness. Rectal examination shows marked tenderness and mucus mixed with blood in the vault. Laboratory results are as follows:

Hemoglobin	10.2 g/dL
Leukocytes	31,600/mm ³
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- ☐ D. Emergent surgery
- ☐ E. Opioid analgesics
- ☐ F. Stool sample for ova and parasites
- ☐ G. Sulfasalazine

Submit

pulse is 130/min, and respiratory rate is 15/min. Abdominal examination reveals distension, diffuse tenderness to palpation, and decreased bowel sounds. There is no rebound tenderness. Rectal examination shows marked tenderness and mucus mixed with blood in the vault. Laboratory results are as follows:

Hemoglobin	10.2 g/dL
Leukocytes	31,600/mm ³
Platelets	459,000/mm ³
Erythrocyte sedimentation rate	54 mm/hr

Intravenous fluids are started, with improvement of blood pressure to 103/58 mm Hg. Which of the following is the most appropriate next step in management of this patient?

- ☒ A. Abdominal x-ray (36%)
- ☐ B. Barium enema (3%)
- ☐ C. Colonoscopy with biopsies (31%)
- ☐ D. Emergent surgery (9%)
- ☐ E. Opioid analgesics (1%)
- ☐ F. Stool sample for ova and parasites (10%)
- ☐ G. Sulfasalazine (7%)

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This patient with weeks of lower abdominal pain, bloody diarrhea, and fecal urgency likely has undiagnosed **inflammatory bowel disease** (IBD) (eg, ulcerative colitis). His acute worsening with **fever**, **abdominal distension**, leukocytosis, hypotension, and tachycardia suggests **toxic megacolon**. Other manifestations of toxic megacolon include altered mental status, peritonitis, and electrolyte abnormalities. If due to severe colitis with massive colonic distension, toxic megacolon may be the first presentation of IBD and is potentially lethal.

Key to the diagnosis of toxic megacolon is radiologic evidence of **colonic distension** (eg, >6 cm dilation of right colon) with manifestations of severe systemic toxicity. Consequently, the initial test of choice in suspected cases is **abdominal x-ray**, a noninvasive study that can be performed quickly, confirm the diagnosis, and exclude perforation. Conservative management (successful in >50% of cases) can initially be instituted and includes bowel rest, nasogastric suction, and either corticosteroids with broad spectrum-antibiotics (due to IBD) or antibiotics targeted at *Clostridium difficile*.

(Choices B and C) Although a barium enema may be helpful in cases of suspected ulcerative colitis, it is contraindicated in suspected toxic megacolon due to the risk of colonic perforation. Complete endoscopic evaluation would be appropriate to confirm IBD if this patient had presented earlier. However, in the setting of toxic megacolon, such a procedure is not recommended due to the risk of perforation. Limited evaluation (eg, proctoscopy or sigmoidoscopy without bowel preparation) can be considered to help identify the etiology once the diagnosis has been confirmed via x-ray.

(Choice D) Severe cases of toxic megacolon not responding to medical therapy may require emergent surgery (eg, subtotal colectomy and end-ileostomy).

(Choice E) Opioids are inadvisable in this patient as their ant motility effects can promote colonic perforation. Other ant motility agents (eg, loperamide) and anticholinergic agents should also be discontinued.

(Choice F) In general, parasitic causes of diarrhea (eg, *Entamoeba histolytica*) do not lead to sepsis and, in the absence of a travel history, are much less likely than other causes.

(Choice G) Toxic megacolon should be confirmed before treatment is initiated; intravenous corticosteroids are preferred. Sulfasalazine for IBD should be started only once acute symptoms have resolved.

Educational objective:

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Key to the diagnosis of toxic megacolon is radiologic evidence of [colonic distension](#) (eg, >6 cm dilation of right colon) with manifestations of severe systemic toxicity. Consequently, the initial test of choice in suspected cases is **abdominal x-ray**, a noninvasive study that can be performed quickly, confirm the diagnosis, and exclude perforation. Conservative management (successful in >50% of cases) can initially be instituted and includes bowel rest, nasogastric suction, and either corticosteroids with broad spectrum-antibiotics (due to IBD) or antibiotics targeted at *Clostridium difficile*.

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Educational objective:

Toxic megacolon may be the initial presentation of inflammatory bowel disease. Key to the diagnosis are radiologic evidence of colonic distension with manifestations of severe systemic toxicity (eg, fever, leukocytosis, hemodynamic instability). About 50% of patients improve with conservative management and corticosteroids.

References

- [Toxic megacolon complicating a first course of Crohn's disease: about two cases.](#)

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Toxic megacolon may be the initial presentation of inflammatory bowel disease. Key to the diagnosis are radiologic evidence of colonic distension with manifestations of severe systemic toxicity (eg, fever, leukocytosis, hemodynamic instability). About 50% of patients improve with conservative management and corticosteroids.

References

- [Toxic megacolon complicating a first course of Crohn's disease: about two cases.](#)

Surgery

Gastrointestinal & Nutrition

Inflammatory bowel disease

Subject

System

Topic

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TUTOR

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A 65-year-old man with a history of moderate chronic obstructive pulmonary disease (COPD) is brought to the emergency department with progressive dyspnea, productive cough, and fever over the past 2 days. Initial evaluation shows that the patient is in respiratory distress. Temperature is 38.8 C (101.8 F), blood pressure is 122/74 mm Hg, pulse is 110/min, and respirations are 32/min; pulse oximetry is 93% on 4 L oxygen by nasal cannula. A presumptive diagnosis of COPD exacerbation is made. His trachea is intubated and he is placed on mechanical ventilation. A central venous catheter is placed in the right subclavian vein. Intravenous antibiotics, glucocorticoids, and inhaled bronchodilators are administered. Despite these measures, the patient continues to desaturate over the next 20 minutes with a pulse oximetry reading of 83% despite breathing 100% inspired oxygen. His inspiratory pressures are elevated. Repeat vital signs show blood pressure of 80/50 mm Hg and pulse of 120/min. The trachea is deviated to the left. Breath sounds are absent on the right side and wheezes are heard on the left side. Neck veins are distended. Which of the following is the best next step in management of this patient?

- ☐ A. Arterial blood gas analysis
- ☐ B. Endotracheal tube repositioning
- ☐ C. Intravenous fluids and norepinephrine
- ☐ D. Needle thoracostomy
- ☐ E. Pericardiocentesis
- ☐ F. Stat chest x-ray

Submit

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- ☐ A. Arterial blood gas analysis (0%)
- ☐ B. Endotracheal tube repositioning (11%)
- ☐ C. Intravenous fluids and norepinephrine (1%)
- ☒ D. Needle thoracostomy (76%)
- ☐ E. Pericardiocentesis (2%)
- ☐ F. Stat chest x-ray (7%)

Omitted
Correct answer
D

76%
Answered correctly

02 secs
Time Spent

01/07/2020
Last Updated

Explanation

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

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

This patient has likely developed a **tension pneumothorax** (TP) as a complication of subclavian central venous catheter placement. TP is a life-threatening condition caused by air within the pleural space that **displaces mediastinal structures** and **compromises cardiopulmonary function**. It develops when injured tissue forms a one-way valve allowing air to enter the pleural space but preventing it from escaping naturally. TP is characterized by rapid-onset severe shortness of breath, tachycardia, tachypnea, hypotension, and distension of the neck veins due to superior vena cava compression. Positive-pressure ventilation can worsen TP by increasing intrathoracic pressures and intensifying the one-way valve effect. As the pleural cavity fills with air, increased pressure is required to initiate inspiratory flow.

TP is a clinical diagnosis, and decompression should be initiated immediately with **needle thoracostomy** (or, if available, direct emergency tube thoracostomy) in **hemodynamically unstable** patients. Classically, the second intercostal space in the midclavicular line has been used, but this

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TP is a clinical diagnosis, and decompression should be initiated immediately with **needle thoracostomy** (or, if available, direct emergency tube thoracostomy) in **hemodynamically unstable** patients. Classically, the second intercostal space in the midclavicular line has been used, but this fails in up to 50% of patients due to chest wall anatomy. Consequently, the fifth intercostal space in the midaxillary line is an excellent alternate site. Needle thoracostomy should be followed by an **emergency tube thoracostomy**.

(Choice A) Although an arterial blood gas would provide information about the severity of respiratory compromise, waiting for such a result is inappropriate.

(Choices B and E) Intubation of the left mainstem bronchus would result in hypoxia and absent right-sided breath sounds, and cardiac tamponade would result in hypotension, tachycardia, and distended neck veins. However, neither condition alone would account for all of this patient's findings or for the tracheal deviation.

(Choice C) Fluid resuscitation and vasopressors are appropriate treatments for shock. Although shock may cause sudden clinical deterioration, it would not explain the lack of breath sounds or tracheal deviation.

(Choice F) In TP, an x-ray will show deviation of the trachea and mediastinum away from the affected side and increased lucency on the affected side of the chest. If there is diagnostic uncertainty or the patient is hemodynamically stable, radiographic confirmation should be considered. Otherwise, treatment of this emergent condition should not be delayed by waiting for radiographic studies.

Educational objective:

Tension pneumothorax is a life-threatening condition caused by air within the pleural space that displaces mediastinal structures and compromises cardiopulmonary function. It is characterized by rapid-onset dyspnea, tachycardia, tachypnea, hypotension, and distension of the neck veins.

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Educational objective:

Tension pneumothorax is a life-threatening condition caused by air within the pleural space that displaces mediastinal structures and compromises cardiopulmonary function. It is characterized by rapid-onset dyspnea, tachycardia, tachypnea, hypotension, and distension of the neck veins. Treatment should be initiated immediately with needle thoracostomy.

References

- [Pneumothorax: from definition to diagnosis and treatment.](#)
- [Pneumothorax: a tale of pain or spontaneity.](#)

SurgeryPulmonary & Critical CarePneumothorax

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A 28-year-old woman, gravida 1 para 1, comes to the office for follow-up 10 days after cesarean delivery. Her pregnancy was uneventful; she went into labor spontaneously at full term but underwent cesarean section due to failure to progress. The patient received epidural analgesia during labor and general anesthesia during surgery. She notes that she still has some lower back discomfort. In addition, her legs feel weaker, and she has been experiencing tingling and numbness in the lower extremities. The patient reports malaise but has had no significant pain or discharge from the surgical wound or vaginal bleeding. She has no other significant medical issues, and her only medication is a daily multivitamin. Temperature is 38.2 C (100.8 F), blood pressure is 110/70 mm Hg, and pulse is 94/min. Physical examination shows clear lungs; normal heart sounds; well-healing surgical incision with no surrounding erythema or discharge; and nontender uterus. Back examination reveals moderate tenderness over the lumbar region. Neurological examination shows weakness of left quadriceps and decreased left knee reflex. Sensation to light touch is decreased over bilateral dorsum of the feet. Which of the following is the most appropriate management for this patient's current symptoms?

- ☐ A. Advise nonsteroidal anti-inflammatory drugs and physical activity as tolerated
- ☐ B. Evaluate for labor-associated peripheral nerve injury
- ☒ C. Obtain urgent MR imaging of the lumbosacral spine
- ☐ D. Reassure that the anesthesia effects will wear off gradually
- ☐ E. Refer to psychiatry due to somatic symptoms of depression

Submit

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- ☐ A. Advise nonsteroidal anti-inflammatory drugs and physical activity as tolerated (5%)
- ☐ B. Evaluate for labor-associated peripheral nerve injury (16%)
- ☒ C. Obtain urgent MR imaging of the lumbosacral spine (72%)
- ☐ D. Reassure that the anesthesia effects will wear off gradually (6%)
- ☐ E. Refer to psychiatry due to somatic symptoms of depression (0%)

Omitted

Correct answer C

72% Answered correctly

02 secs Time Spent

02/29/2020 Last Updated

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ESR - erythrocyte sedimentation rate.

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This patient underwent epidural anesthesia 10 days ago and now has lumbar back pain, low-grade fever, and lower-extremity neurologic symptoms (eg, weakness, tingling, numbness), raising strong suspicion for **spinal epidural abscess** (SEA). Most cases arise via hematogenous spread of a distant infection, contiguous spread from an adjacent infection (eg, vertebral osteomyelitis), or following **direct inoculation** during spinal/**epidural anesthesia**.

The epidural space is a vertical, contiguous area that contains fat, arteries, and a venous plexus; infections tend to affect multiple spinal levels and cause progressive **neurologic impairment** due to direct spinal cord compression, thrombophlebitis of the draining venous plexus, and/or interruption of the arterial blood supply. Although patients classically have the triad of **fever, spinal pain, and neurologic symptoms**, all 3 are present in a minority of cases. Most patients have fever, malaise, and neurologic symptoms that typically progress in the following fashion (due to worsening spinal cord compression):

1. Focal back pain →
2. Nerve root pain (eg, shooting, electric-shock sensation) →
3. Motor weakness, sensory changes, bowel/bladder dysregulation →
4. Paralysis

Early diagnosis is crucial to prevent paralysis and death (**Choice D**); **MRI of the affected spinal area** is the test of choice because it is positive early in the disease course and provides excellent visualization of the extent of infection. Surgical drainage plus antibiotic therapy is generally required for treatment.

(Choice A) Nonsteroidal anti-inflammatory drugs and early physical activity are important components of treating lumbosacral radiculopathy, which usually presents with back pain radiating along the affected dermatome. Although motor and sensory impairment can occur, fever is atypical.

(Choice B) Lower-extremity peripheral nerve injury is a relatively common obstetric complication due to nerve compression or vascular compromise during labor. However, it rarely causes fever.

(Choice E) This patient with fever and neurologic symptoms on examination is unlikely to have somatic symptoms of depression. Given recent

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- 2. Nerve root pain (eg, shooting, electric-shock sensation) →
- 3. Motor weakness, sensory changes, bowel/bladder dysregulation →
- 4. Paralysis

Early diagnosis is crucial to prevent paralysis and death (**Choice D**); **MRI of the affected spinal area** is the test of choice because it is positive early in the disease course and provides excellent visualization of the extent of infection. Surgical drainage plus antibiotic therapy is generally required for treatment.

(Choice A) Nonsteroidal anti-inflammatory drugs and early physical activity are important components of treating lumbosacral radiculopathy, which usually presents with back pain radiating along the affected dermatome. Although motor and sensory impairment can occur, fever is atypical.

(Choice B) Lower-extremity peripheral nerve injury is a relatively common obstetric complication due to nerve compression or vascular compromise during labor. However, it rarely causes fever.

(Choice E) This patient with fever and neurologic symptoms on examination is unlikely to have somatic symptoms of depression. Given recent epidural anesthesia, she requires MRI of the spine to evaluate for SEA.

Educational objective:

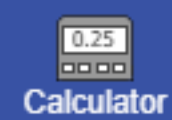
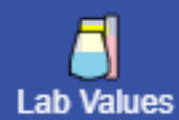
Spinal epidural abscess often presents with several days/weeks of fever, malaise, and the following progressive neurologic symptoms: focal back pain → nerve root pain → motor weakness, sensory changes, and bowel/bladder dysregulation → paralysis. Suspected cases require urgent MRI spine; treatment generally includes surgical decompression and antibiotics. Epidural anesthesia is a common triggering event (due to direct inoculation).

Surgery	Nervous System	Epidural abscess
Subject	System	Topic

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Item 14 of 40
Question Id: 3227



A 20-year-old man is brought to the emergency department after falling off a trampoline. He had been drinking alcohol with some friends and began jumping on a trampoline in his neighbor's backyard. The patient tried to do a backflip and landed on his head. Paramedics were called and found him confused but able to follow commands. However, he was unable to move his legs or his hands. The patient was placed in spine immobilization and transported to the emergency department. On arrival, his vital signs are within normal limits, but he has increasing shortness of breath and requests to sit up to help his breathing. Chest x-ray is normal, and ECG reveals sinus tachycardia. Over the next 30 minutes, his respirations become faster and shallower with more use of accessory muscles. The patient becomes sleepier and has difficulty responding to commands. Which of the following is the most appropriate next step in management?

- ☐ A. Nasotracheal intubation
- ☐ B. Needle cricothyroidotomy
- ☐ C. Noninvasive positive pressure ventilation
- ☐ D. Orotracheal intubation
- ☐ E. Surgical tracheostomy

Submit



A 20-year-old man is brought to the emergency department after falling off a trampoline. He had been drinking alcohol with some friends and began jumping on a trampoline in his neighbor's backyard. The patient tried to do a backflip and landed on his head. Paramedics were called and found him confused but able to follow commands. However, he was unable to move his legs or his hands. The patient was placed in spine immobilization and transported to the emergency department. On arrival, his vital signs are within normal limits, but he has increasing shortness of breath and requests to sit up to help his breathing. Chest x-ray is normal, and ECG reveals sinus tachycardia. Over the next 30 minutes, his respirations become faster and shallower with more use of accessory muscles. The patient becomes sleepier and has difficulty responding to commands. Which of the following is the most appropriate next step in management?

- ☐ A. Nasotracheal intubation (10%)
- ☐ B. Needle cricothyroidotomy (7%)
- ☐ C. Noninvasive positive pressure ventilation (5%)
- ☒ D. Orotracheal intubation (70%)
- ☐ E. Surgical tracheostomy (6%)

Omitted

Correct answer D

70% Answered correctly

01 sec Time Spent

05/18/2020 Last Updated

Explanation

This patient who fell onto his head resulting in an inability to move his legs and hands likely has **cervical spine trauma**. In addition, his tachypnea, use of accessory muscles, and increasing somnolence are concerning for hypercapnic respiratory failure due to **diaphragmatic paralysis**. After a high cervical spine injury, patients are at risk for immediate diaphragmatic paralysis because the diaphragm is innervated by

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Question Id: 3227

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Explanation

This patient who fell onto his head resulting in an inability to move his legs and hands likely has **cervical spine trauma**. In addition, his tachypnea, use of accessory muscles, and increasing somnolence are concerning for hypercapnic respiratory failure due to **diaphragmatic paralysis**. After a high cervical spine injury, patients are at risk for immediate diaphragmatic paralysis because the diaphragm is innervated by cervical nerve roots from C3-C5. However, if the spinal cord is injured lower than C5, a delayed diaphragmatic paralysis may occur (as in this patient) due to ascending edema.

As in all trauma patients, primary survey includes assessment of the **airway** (in addition to breathing and circulation). In patients with impending respiratory failure, the best next step in management is **orotracheal intubation**, even with evidence of an unstable cervical spine injury, because this procedure can be rapidly performed and is relatively noncomplex. Typically, this is done with **manual stabilization of the cervical spine** to minimize neck movement during intubation.

(Choice A) Nasotracheal intubation may be performed over a fiberoptic laryngoscope, or more often, the endotracheal tube is blindly passed through the nose and then direct laryngoscopy is performed to visualize the tube passing through the larynx. However, this adds unnecessary complexity (and increased time) to this patient's management, does not decrease neck extension, and does not result in a safer airway than orotracheal intubation.

(Choice B) Needle cricothyroidotomy can be performed when other, less invasive techniques of airway management have failed (or are likely to fail). It is used only temporarily until a more secure airway can be placed because it offers no airway protection from secretions, may lead to CO₂ retention (and is particularly inappropriate in patients with hypercapnic respiratory failure), and gives less feedback about respiratory function (eg, ventilatory volumes, pressures, gas exchange).

(Choice C) Noninvasive positive pressure ventilation (continuous positive airway pressure) is used primarily to improve oxygenation. This patient is likely hypercapnic due to diaphragm paralysis and requires improved ventilation rather than simply oxygenation. Noninvasive positive pressure ventilation also does not provide airway protection.

(Choice E) Orotracheal intubation carries less risk (eg, bleeding, tracheal stenosis) and can be performed quicker than surgical tracheostomy; therefore, it is first-line management. In addition, the neck is often extended during tracheostomy, so this procedure would not necessarily prevent cervical spine movement.

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As in all trauma patients, primary survey includes assessment of the **airway** (in addition to breathing and circulation). In patients with impending respiratory failure, the best next step in management is **orotracheal intubation**, even with evidence of an unstable cervical spine injury, because this procedure can be rapidly performed and is relatively noncomplex. Typically, this is done with **manual stabilization of the cervical spine** to minimize neck movement during intubation.

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(Choice E) Orotracheal intubation carries less risk (eg, bleeding, tracheal stenosis) and can be performed quicker than surgical tracheostomy; therefore, it is first-line management. In addition, the neck is often extended during tracheostomy, so this procedure would not necessarily prevent cervical spine movement.

Educational objective:

Patients with cervical spine injuries are at risk of respiratory compromise. Orotracheal intubation with manual stabilization of the cervical spine is recommended for initial airway management.

References

- [Potential cervical spine injury and difficult airway management for emergency intubation of trauma adults in the emergency department—a systematic review.](#)

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An 80-year-old Asian man comes to the office for evaluation of fatigue and 4.5 kg (10 lb) weight loss. Medical history is notable for benign prostatic hyperplasia (which is treated with tamsulosin), coronary artery disease, and hypertension. The patient does not use tobacco and drinks 2 shots of whiskey daily. He eats a vegetarian diet. Vital signs are normal. Physical examination shows a nodular prostate and inguinal lymphadenopathy. Serum prostate-specific antigen level is 25 ng/mL (normal: <4.5 ng/mL). Biopsy of the prostate reveals adenocarcinoma. Which of the following risk factors is most strongly associated with development of cancer in this patient?

- ☐ A. Advanced age
- ☐ B. Alcohol use
- ☐ C. Benign prostatic hyperplasia
- ☐ D. Ethnicity
- ☐ E. Use of tamsulosin
- ☐ F. Vegetarian diet

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- ✓ ☒ A. Advanced age (86%)
- ☐ B. Alcohol use (5%)
- ☐ C. Benign prostatic hyperplasia (4%)
- ☐ D. Ethnicity (3%)
- ☐ E. Use of tamsulosin (0%)
- ☐ F. Vegetarian diet (0%)

Omitted
Correct answer
A

86%
Answered correctly

01 sec
Time Spent

03/13/2020
Last Updated

Explanation

Comparison of benign prostatic hyperplasia & prostate cancer		
	BPH	Prostate cancer

Comparison of benign prostatic hyperplasia & prostate cancer		
	BPH	Prostate cancer
Risk factors	Age >50	Age >40, African American & family history
Affected part	Central portion (transitional zone)	Usually peripheral zone of prostate but can be anywhere
Examination	- Symmetrically enlarged & smooth prostate - Can have elevated PSA	- Asymmetrically enlarged, nodules & firm prostate - Markedly elevated PSA

BPH = benign prostatic hyperplasia; PSA = prostate-specific antigen.

Prostate adenocarcinoma is the second most common malignancy in men worldwide. Although most cases are asymptomatic, prostate cancer can present with systemic symptoms (eg, fatigue, weight loss), bone pain (due to metastases), and/or lower urinary tract symptoms. **Prostatic nodules** or asymmetry on digital rectal examination, inguinal lymphadenopathy, and significant **elevation of prostate-specific antigen** (PSA) support the diagnosis but are not present in all cases. Confirmation generally requires transrectal biopsy.

The greatest risk factor for prostate cancer is **advanced age**. Men age <40 rarely have prostate cancer, but prevalence steadily increases as age advances; 30%-80% of men age >70 have histologic evidence of prostate cancer. Other risk factors for prostate cancer are less potent, including:

- Ethnicity: Black men have the greatest risk of prostate cancer and tend to have more aggressive tumors and present at a later stage of disease. Risk is thought to be increased in this population due to genetic predisposition. Although Asian men are at less overall risk for prostate cancer than black, white, or Hispanic men, risk increases when they live in or move to Western countries (likely due to dietary changes) (**Choice D**).
- Diet: Diets high in animal fat (eg, alpha-linoleic acid) and low in fruits and vegetables cause a mild increase in risk for prostate cancer. Vegetarian and fruit-heavy diets do not increase risk (**Choice F**).

(**Choice B**) Alcohol intake does not seem to increase the overall risk of prostate cancer. However, patients who consume excessive alcohol and develop prostate cancer may have more aggressive tumors.

(**Choices C, D, and E**) Most studies indicate minimal, even elevation in the risk of prostate cancer in patients with underlying benign prostatic

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Question Id: 16012

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Prostate adenocarcinoma is the second most common malignancy in men worldwide. Although most cases are asymptomatic, prostate cancer can present with systemic symptoms (eg, fatigue, weight loss), bone pain (due to metastases), and/or lower urinary tract symptoms. **Prostatic nodules** or asymmetry on digital rectal examination, inguinal lymphadenopathy, and significant **elevation of prostate-specific antigen** (PSA) support the diagnosis but are not present in all cases. Confirmation generally requires transrectal biopsy.

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- Diet: Diets high in animal fat (eg, alpha-linoleic acid) and low in fruits and vegetables cause a mild increase in risk for prostate cancer. Vegetarian and fruit-heavy diets do not increase risk (**Choice F**).

(**Choice B**) Alcohol intake does not seem to increase the overall risk of prostate cancer. However, patients who consume excessive alcohol and develop prostate cancer may have more aggressive tumors.

(**Choices C, D, and E**) Most studies indicate minimal or no elevation in the risk of prostate cancer in patients with underlying benign prostatic hypertrophy (BPH). This is supported by the fact that BPH typically affects the central/transitional zone of the prostate, but prostate cancer primarily occurs in the periphery of the gland. Treatment of BPH with alpha-1-adrenergic antagonists (eg, tamsulosin) does not seem to have a strong effect on the development of prostate cancer. In contrast, 5-alpha reductase inhibitors (eg, finasteride, dutasteride), which block peripheral conversion of testosterone to dihydrotestosterone (the more active form), reduce risk.

Educational objective:

The greatest risk factor for prostate cancer is advanced age; approximately 30%-80% of men age >70 have histologic evidence of prostate cancer. Less-prominent risk factors include black ethnicity and a diet high in meat and low in fruits and vegetables.

References

- [Epidemiology, etiology, diagnosis and treatment of prostate cancer.](#)

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Educational objective:

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References

- [Epidemiology, etiology, diagnosis and treatment of prostate cancer.](#)

Surgery	Male Reproductive System	Prostate cancer
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A 62-year-old man undergoes a partial pancreatectomy for exocrine pancreatic cancer. The surgery is complicated by excessive peripancreatic bleeding requiring careful surgical hemostasis. The patient receives packed red blood cell transfusion during the surgery as well as intravenous normal saline. He is transferred to the surgical intensive care unit for close monitoring and is successfully extubated. Twelve hours later, the nurse reports decreased oxygen saturation. The patient has received multiple doses of morphine for pain control since the surgery. Temperature is 37.5 C (99.5 F), blood pressure is 80/40 mm Hg, pulse is 112/min, and respirations are 28/min. The patient's pulse oximetry shows 87% on 4 L nasal cannula oxygen. Examination reveals bilateral basal crackles. The abdomen is mildly distended and tender, and bowel sounds are decreased. There is no rebound tenderness or rigidity. Pulmonary artery catheter readings show a cardiac index of 2 L/min/m² (normal, 2.8-4.2) and a pulmonary capillary wedge pressure of 20 mm Hg (normal, 6-15). Which of the following is the most likely etiology of this patient's current condition?

- ☐ A. Acute pancreatitis
- ☐ B. Adrenal crisis
- ☐ C. Myocardial infarction
- ☐ D. Pulmonary embolism
- ☐ E. Retroperitoneal hemorrhage
- ☐ F. Transfusion-related acute lung injury

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- ☐ A. Acute pancreatitis (2%)
- ☐ B. Adrenal crisis (1%)
- ☒ C. Myocardial infarction (48%)
- ☐ D. Pulmonary embolism (13%)
- ☐ E. Retroperitoneal hemorrhage (9%)
- ☐ F. Transfusion-related acute lung injury (23%)

Omitted
Correct answer
C

48%
Answered correctly

01 sec
Time Spent

01/26/2020
Last Updated

Explanation

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Question Id: 12335

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Hemodynamic measurements in shock				
Parameter	Hypovolemic shock	Cardiogenic shock	Obstructive shock	Distributive shock
CVP (right-sided preload)	↓	↑	↑	↓
PCWP (left-sided preload)	↓	↑	↓*	↓
Cardiac index (LV output)	↓	↓	↓	↑**
SVR (afterload)	↑	↑	↑	↓
SvO ₂	↓	↓	↓	↑**

*In tamponade, left-sided preload is decreased, but measured PCWP is paradoxically increased due to external compression by pericardial fluid.

**Cardiac index and SvO₂ are usually decreased in neurogenic shock due to impaired sympathetic reflexes.

CVP = central venous pressure; **LV** = left ventricular; **PCWP** = pulmonary capillary wedge pressure; **SvO₂** = mixed venous oxygen saturation; **SVR** = systemic vascular resistance.

This patient is most likely in **cardiogenic shock** due to an **acute myocardial infarction (MI)**. **Perioperative MI** is common in patients

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This patient is most likely in **cardiogenic shock** due to an **acute myocardial infarction (MI)**. **Perioperative MI** is common in patients undergoing noncardiac surgery; intraoperative hemorrhage requiring blood transfusion increases the risk (likely due to reduced oxygen delivery to the myocardium). Patients with perioperative MI often **lack chest pain**, possibly due to receipt of postoperative pain control (eg, morphine).

Significant infarction of the left ventricle leads to impaired contractility and a decrease in left ventricular stroke volume. **Cardiac index (CI)**, which is a measure of cardiac output (stroke volume × heart rate) adjusted per body surface area, is low as tachycardia cannot make up for the decrease in stroke volume. The increased pressure in the left ventricle is transmitted back to the left atrium and the lungs; therefore, **pulmonary capillary wedge pressure (PCWP)**, which estimates left atrial pressure, is elevated. Patients experience dyspnea and hypoxemia due to pulmonary edema, and lung examination reveals bilateral crackles. **Decreased cardiac output** leads to hypotension, for which the body attempts to compensate by peripheral vasoconstriction and increased systemic vascular resistance. Low tissue perfusion signals the tissues to extract more oxygen from the blood, which decreases mixed venous oxygen saturation.

(Choice A) Acute pancreatitis can progress to systemic inflammatory response syndrome and lead to distributive shock. Pulmonary artery catheterization (PAC) reveals high CI and low PCWP.

(Choice B) Hypotension due to adrenal crisis is caused by distributive shock and intravascular volume depletion. PAC reveals normal or high CI and normal or low PCWP.

(Choice D) **Obstructive shock** due to pulmonary embolism may lead to a decrease in CI due to decreased delivery of blood through the pulmonary circulation (decreased left ventricular preload). PCWP is usually normal or low.

(Choice E) Retroperitoneal hemorrhage leads to intravascular volume depletion and **hypovolemic shock**. CI and PCWP are typically low.

(Choice F) Transfusion-related acute lung injury (TRALI) refers to the development of fever, hypotension, and noncardiogenic pulmonary edema within 6 hours of blood product administration. Because left ventricular function is typically normal, PAC reveals normal or high CI and normal or low PCWP.

Educational objective:

Patients with perioperative myocardial infarction may lack chest pain and can develop cardiogenic shock due to left ventricular systolic dysfunction. Pulmonary artery catheterization reveals a low cardiac index and elevated pulmonary capillary wedge pressure.

References

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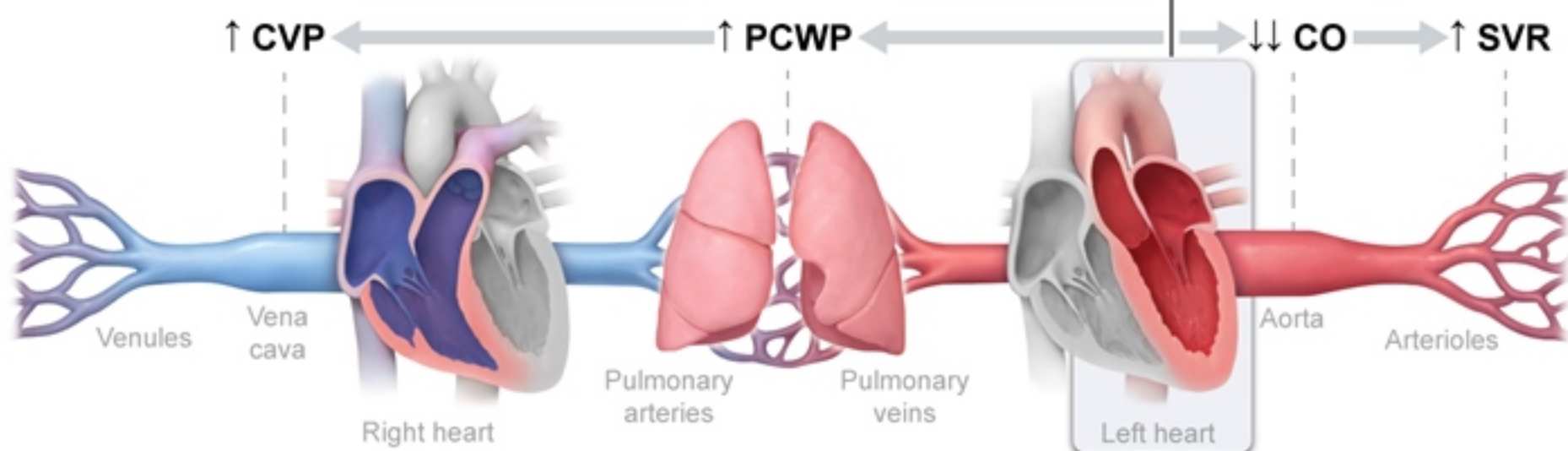
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This patient is most likely in **cardiogenic shock** due to an **acute myocardial infarction (MI)**. **Perioperative MI** is common in patients

Exhibit Display

Cardiogenic shock

Primary disturbance
Left ventricular failure



CO = cardiac output; CVP = central venous pressure;
PCWP = pulmonary capillary wedge pressure; SVR = systemic vascular resistance.
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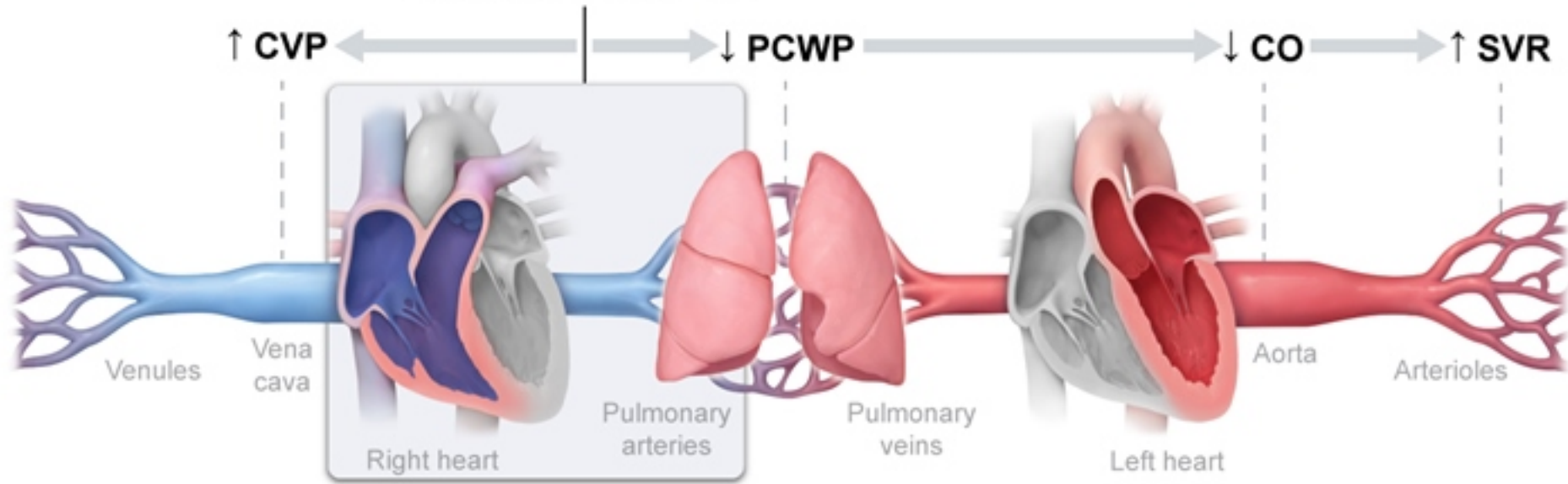
References

This patient is most likely in **cardiogenic shock** due to an **acute myocardial infarction (MI)**. **Perioperative MI** is common in patients

Exhibit Display

Obstructive shock

Primary disturbance
Impeded cardiopulmonary blood flow
(eg, PE, tension PTX)



CO = cardiac output; CVP = central venous pressure; PCWP = pulmonary capillary wedge pressure;
PE = pulmonary embolism; PTX = pneumothorax; SVR = systemic vascular resistance.

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A 35-year-old woman comes to the office due to blood in her urine. She has been working in her yard for 2 days creating a new garden. Review of systems is positive for recurrent bilateral flank discomfort. The patient has no fever, chills, vomiting, dysuria, or urinary frequency. She has never had blood in her urine before. She is sexually active with a male partner and uses condoms for contraception. The patient does not use tobacco, alcohol, or illicit drugs. Her father died from kidney disease at age 40. Temperature is 37 C (98.6 F), blood pressure is 180/120 mm Hg in both arms, and pulse is 82/min and regular. BMI is 40 kg/m². Cardiopulmonary examination shows no abnormalities. The abdomen is soft and without bruits. Laboratory results are as follows:

Serum chemistry

Blood urea nitrogen	24 mg/dL
Creatinine	1.6 mg/dL

Urine studies

Specific gravity	1.007
Protein	none
Blood	moderate
Glucose	negative
Ketones	negative
Leukocyte esterase	negative
Nitrites	negative
Bacteria	none
Red blood cells	20-30/hpf

	Serum chemistry	
	Blood urea nitrogen	24 mg/dL
	Creatinine	1.6 mg/dL
	Urine studies	
	Specific gravity	1.007
	Protein	none
	Blood	moderate
	Glucose	negative
	Ketones	negative
	Leukocyte esterase	negative
	Nitrites	negative
	Bacteria	none
	Red blood cells	20-30/hpf
	Casts	none

Which of the following is the most likely diagnosis?

- ☐ A. Bladder cancer
- ☐ B. Glomerulonephritis
- ☐ C. Nephrolithiasis

	Blood	moderate
	Glucose	negative
	Ketones	negative
	Leukocyte esterase	negative
	Nitrites	negative
	Bacteria	none
	Red blood cells	20-30/hpf
	Casts	none

Which of the following is the most likely diagnosis?

- ☐ A. Bladder cancer
- ☐ B. Glomerulonephritis
- ☐ C. Nephrolithiasis
- ☐ D. Polycystic kidney disease
- ☐ E. Rhabdomyolysis
- ☐ F. Urinary tract infection

Submit

	Blood	moderate
	Glucose	negative
	Ketones	negative
	Leukocyte esterase	negative
	Nitrites	negative
	Bacteria	none
	Red blood cells	20-30/hpf
	Casts	none

Which of the following is the most likely diagnosis?

- ☐ A. Bladder cancer (1%)
- ☐ B. Glomerulonephritis (5%)
- ☐ C. Nephrolithiasis (6%)
- ☒ D. Polycystic kidney disease (80%)
- ☐ E. Rhabdomyolysis (6%)
- ☐ F. Urinary tract infection (0%)

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Autosomal dominant polycystic kidney disease	
Clinical presentation	• Most patients asymptomatic until age 30-40 • Flank pain, hematuria • Hypertension • Palpable abdominal masses (usually bilateral) • Chronic kidney disease (CKD)
Extrarenal features	• Cerebral aneurysms • Hepatic & pancreatic cysts • Mitral valve prolapse, aortic regurgitation • Colonic diverticulosis • Ventral & inguinal hernias
Diagnosis	• Ultrasonography showing multiple renal cysts
Management	• Aggressive control of risk factors for CV & CKD • ACE inhibitors preferred for hypertension • Hemodialysis, renal transplant for ESRD

CV = cardiovascular; ESRD = end-stage renal disease.

This patient most likely has **autosomal dominant polycystic kidney disease** (ADPKD). Patients begin developing renal cysts early in life; by mid-adulthood the cysts become large and numerous enough to cause clinical disease. Recurrent **flank pain** and **hematuria** are common in patients with ADPKD; these symptoms often result from cyst rupture that can be triggered by activities involving bending and exertion (eg, yard work). **Hypertension** is a typical early disease manifestation that results from localized renal ischemia with increased renin secretion. As the disease advances, patients experience **progressive renal dysfunction** (eg, elevated creatinine in this patient) that eventually leads to end-stage renal disease.

Early in the disease process, patients also develop a **urinary concentrating defect** (evidenced by low specific gravity on urinalysis), likely due to

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This patient most likely has **autosomal dominant polycystic kidney disease** (ADPKD). Patients begin developing renal cysts early in life; by mid-adulthood the cysts become large and numerous enough to cause clinical disease. Recurrent **flank pain** and **hematuria** are common in patients with ADPKD; these symptoms often result from cyst rupture that can be triggered by activities involving bending and exertion (eg, yard work). **Hypertension** is a typical early disease manifestation that results from localized renal ischemia with increased renin secretion. As the disease advances, patients experience **progressive renal dysfunction** (eg, elevated creatinine in this patient) that eventually leads to end-stage renal disease.

Early in the disease process, patients also develop a **urinary concentrating defect** (evidenced by low specific gravity on urinalysis), likely due to renal tubular destruction. In effect, a mild nephrogenic diabetes insipidus is created with resulting **increased circulating vasopressin** levels. The high vasopressin levels may encourage renal cyst growth, and vasopressin-2 receptor antagonists (eg, tolvaptan) have been shown to slow ADPKD progression in some patients. Other treatments for ADPKD are mostly supportive and involve minimizing risk factors for worsening of chronic kidney disease.

(Choice A) Bladder cancer most commonly presents with hematuria but typically occurs in older patients with significant smoking history. It is unlikely in this young woman with no smoking history and would not explain her renal dysfunction.

(Choice B) Glomerulonephritis can occur due to rheumatologic disease (eg, systemic lupus erythematosus) or vasculitis (eg, polyangiitis with granulomatosis) and may affect young patients. Although hematuria and hypertension are a common presentation, red blood cell casts and protein are expected on urinalysis.

(Choice C) Nephrolithiasis is a common manifestation of ADPKD and typically presents with hematuria and flank pain. However, nephrolithiasis alone would not explain this patient's early-onset hypertension and family history of early death from renal disease.

(Choice E) Rhabdomyolysis results from excessive skeletal muscle breakdown following injury or intense exertion. It causes myoglobinuria, which appears grossly similar to hematuria and is mistakenly detected as blood on urinalysis. However, it is not true hematuria and no red blood cells are present on urine microscopy.

(Choice F) Urinary tract infection (UTI) often causes hematuria; however, leukocyte esterase, nitrites, and/or bacteria are also expected on urine studies. In addition, this patient has no dysuria or urinary frequency to suggest UTI.

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Early in the disease process, patients also develop a **urinary concentrating defect** (evidenced by low specific gravity on urinalysis), likely due to renal tubular destruction. In effect, a mild nephrogenic diabetes insipidus is created with resulting **increased circulating vasopressin** levels. The high vasopressin levels may encourage renal cyst growth, and vasopressin-2 receptor antagonists (eg, tolvaptan) have been shown to slow ADPKD progression in some patients. Other treatments for ADPKD are mostly supportive and involve minimizing risk factors for worsening of chronic kidney disease.

(Choice A) Bladder cancer most commonly presents with hematuria but typically occurs in older patients with significant smoking history. It is unlikely in this young woman with no smoking history and would not explain her renal dysfunction.

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(Choice C) Nephrolithiasis is a common manifestation of ADPKD and typically presents with hematuria and flank pain. However, nephrolithiasis alone would not explain this patient's early-onset hypertension and family history of early death from renal disease.

(Choice E) Rhabdomyolysis results from excessive skeletal muscle breakdown following injury or intense exertion. It causes myoglobinuria, which appears grossly similar to hematuria and is mistakenly detected as blood on urinalysis. However, it is not true hematuria and no red blood cells are present on urine microscopy.

(Choice F) Urinary tract infection (UTI) often causes hematuria; however, leukocyte esterase, nitrites, and/or bacteria are also expected on urine studies. In addition, this patient has no dysuria or urinary frequency to suggest UTI.

Educational objective:

Autosomal dominant polycystic kidney disease commonly presents with hypertension, hematuria, and recurrent flank pain in patients in their 30s or 40s. Treatment is mostly supportive, although vasopressin-2 receptor antagonists (eg, tolvaptan) may slow disease progression in some patients.

References

- Autosomal dominant polycystic kidney disease.
- Vasopressin, renin, and renal concentrating capacity in patients with autosomal dominant polycystic kidney disease without renal

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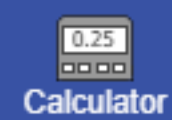
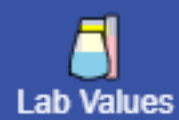
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Question Id: 4360



A 32-year-old man comes to the emergency department with intense, midline chest pain and diaphoresis of 4 hours duration. Prior to the onset of pain, he developed nausea and recurrent vomiting after returning from a party. His medical conditions include HIV infection, alcohol use disorder, and alcoholic hepatitis. The patient uses cocaine regularly and does not take his medications regularly. Temperature is 38.3 C (101 F), blood pressure is 100/60 mm Hg, pulse is 120/min, and respirations are 28/min. Examination shows injected conjunctivae and bilateral dilated pupils. Breath sounds are present on the right but diminished on the left. Heart sounds are normal. Chest x-ray demonstrates a widened mediastinum and moderate left-sided pleural effusion. ECG shows sinus tachycardia. The pleural fluid is found to be a yellow exudate with high amylase content. Which of the following is the most likely diagnosis in this patient?

- ☐ A. Acute pancreatitis
- ☐ B. Aortic dissection
- ☐ C. Aspiration pneumonia
- ☐ D. Esophageal perforation
- ☐ E. Myocardial infarction

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- ☐ A. Acute pancreatitis (12%)
- ☐ B. Aortic dissection (11%)
- ☐ C. Aspiration pneumonia (2%)
- ☒ D. Esophageal perforation (72%)
- ☐ E. Myocardial infarction (0%)

Omitted
Correct answer
D

72%
Answered correctly

01 sec
Time Spent

04/05/2020
Last Updated

Explanation

Esophageal perforation	

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 midline chest pain, fever, and a widened mediastinum in the setting of protracted vomiting, which are most concerning for **esophageal perforation** (EP).

Effort rupture of the esophagus (Boerhaave syndrome) can occur with repeated **vomiting**, particularly when the patient resists the vomiting reflex. The perforation allows gastrointestinal contents to leak from the esophagus into the mediastinum (causing **widened mediastinum** on chest x-ray) and/or into the pleural space (causing **pleural effusion**). The inflammatory gastrointestinal contents often cause **severe chest pain** and a systemic inflammatory response (eg, **fever**, tachycardia) that can quickly progress to septic shock and death.

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. Pleural fluid analysis is not required to confirm EP, but if performed, typically shows low pH and **very high amylase** (>2500 IU/L from leaked saliva) and may show food particles. Surgical consultation should be obtained as soon as the diagnosis is made because most perforations require emergent operative debridement and repair.

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Settings

This patient has midline chest pain, fever, and a widened mediastinum in the setting of protracted vomiting, which are most concerning for **esophageal perforation** (EP).

Effort rupture of the esophagus (Boerhaave syndrome) can occur with repeated **vomiting**, particularly when the patient resists the vomiting reflex. The perforation allows gastrointestinal contents to leak from the esophagus into the mediastinum (causing **widened mediastinum** on chest x-ray) and/or into the pleural space (causing **pleural effusion**). The inflammatory gastrointestinal contents often cause **severe chest pain** and a systemic inflammatory response (eg, **fever**, tachycardia) that can quickly progress to septic shock and death.

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. Pleural fluid analysis is not required to confirm EP, but if performed, typically shows low pH and **very high amylase** (>2500 IU/L from leaked saliva) and may show food particles. Surgical consultation should be obtained as soon as the diagnosis is made because most perforations require emergent operative debridement and repair.

(Choice A) Acute pancreatitis can cause a unilateral, left-sided, exudative pleural effusion with a high amylase concentration (due to high serum amylase levels). However, pancreatitis presents more classically as epigastric pain radiating to the back rather than chest pain and would not cause mediastinal widening on chest x-ray.

(Choice B) Severe chest pain accompanied by a widened mediastinum and unilateral pleural effusion (possible hemothorax) is concerning for aortic dissection in a patient actively using cocaine (a risk factor), as in this patient with injected conjunctivae and dilated pupils. However, aortic dissection usually has associated findings such as pulse/blood pressure variation (eg, >20 mm Hg blood pressure difference between the extremities), and fever is uncommon.

(Choice C) The patient is at risk for aspiration from protracted vomiting. Although fever, tachypnea, and pleural effusion (possible parapneumonic effusion) are concerning for aspiration pneumonia, severe chest pain is not typical, and infiltrates would be expected on chest x-ray. In addition, pleural fluid analysis of a parapneumonic effusion would not be expected to show elevated amylase.

(Choice E) Severe chest pain in the setting of cocaine use (coronary vasospasm) is concerning for myocardial infarction. However, myocardial infarction is less likely given the lack of ischemic changes on ECG; also, it would not account for this patient's unilateral pleural effusion or widened mediastinum on chest x-ray.

Educational objective:

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amylase levels). However, pancreatitis presents more classically as epigastric pain radiating to the back rather than chest pain and would not cause mediastinal widening on chest x-ray.

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(Choice E) Severe chest pain in the setting of cocaine use (coronary vasospasm) is concerning for myocardial infarction. However, myocardial infarction is less likely given the lack of ischemic changes on ECG; also, it would not account for this patient's unilateral pleural effusion or widened mediastinum on chest x-ray.

Educational objective:

Effort rupture of the esophagus (Boerhaave syndrome) may occur during protracted vomiting. Chest x-ray may show leaked esophageal fluid collecting in the mediastinum (mediastinal widening) or pleural space (pleural effusion). Pleural fluid analysis may show low pH and very high amylase (>2500 IU/L). Confirmation with esophagography or CT scan using water-soluble contrast should prompt emergent surgical consultation.

References

- [Esophageal perforation.](#)
- [Esophageal perforation: diagnostic work-up and clinical decision-making in the first 24 hours.](#)

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Settings

A 60-year-old man undergoes a laparotomy for intestinal obstruction secondary to postoperative adhesions from a cholecystectomy 2 years ago. His other medical problems include type 2 diabetes mellitus, hypothyroidism, and hypertension. On postoperative day 3, he complains of intense pain around his laparotomy wound. His temperature is 38.3 C (101 F), blood pressure is 121/76 mm Hg, pulse is 100/min, and respirations are 16/min. Examination of the wound shows abundant cloudy-gray discharge and dusky, friable subcutaneous tissue. Sensation is decreased at the wound edges. His serum glucose level is 312 mg/dL. Which of the following is the most appropriate next step in management of this patient?

- ☐ A. Daily dressing changes and tight glucose control
- ☐ B. Parenteral antibiotics and negative-pressure wound therapy
- ☐ C. Parenteral antibiotics and observation
- ☐ D. Parenteral antibiotics and urgent surgical debridement
- ☐ E. Topical antibiotics and observation

Submit



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A 60-year-old man undergoes a laparotomy for intestinal obstruction secondary to postoperative adhesions from a cholecystectomy 2 years ago. His other medical problems include type 2 diabetes mellitus, hypothyroidism, and hypertension. On postoperative day 3, he complains of intense pain around his laparotomy wound. His temperature is 38.3 C (101 F), blood pressure is 121/76 mm Hg, pulse is 100/min, and respirations are 16/min. Examination of the wound shows abundant cloudy-gray discharge and dusky, friable subcutaneous tissue. Sensation is decreased at the wound edges. His serum glucose level is 312 mg/dL. Which of the following is the most appropriate next step in management of this patient?

- ☐ A. Daily dressing changes and tight glucose control (9%)
- ☐ B. Parenteral antibiotics and negative-pressure wound therapy (16%)
- ☐ C. Parenteral antibiotics and observation (5%)
- ☒ D. Parenteral antibiotics and urgent surgical debridement (68%)
- ☐ E. Topical antibiotics and observation (0%)

Omitted

Correct answer D

68% Answered correctly

02 secs Time Spent

02/17/2020 Last Updated

Explanation

This patient has the following signs and symptoms suggestive of **necrotizing** surgical site infection:

- Pain, edema, or erythema spreading beyond the surgical site
- Systemic signs such as fever, tachycardia, or hypotension
- Paresthesia or anesthesia at the edges of the wound

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Settings

This patient has the following signs and symptoms suggestive of **necrotizing** surgical site infection:

- Pain, edema, or erythema spreading beyond the surgical site
- Systemic signs such as fever, tachycardia, or hypotension
- Paresthesia or anesthesia at the edges of the wound
- Purulent, cloudy-gray discharge ("**dishwater drainage**")
- Subcutaneous gas or crepitus

Necrotizing surgical site infections occur more commonly in **patients with diabetes** and are usually **polymicrobial**. These infections are considered emergencies if they involve the fascial plane and develop into necrotizing fasciitis. The most important step in management of this condition is early **surgical exploration** to assess the extent of the process and debride necrotic tissues. Adjunctive therapies, including broad-spectrum antibiotics, adequate hydration, and tight glycemic control, are also important but are secondary to surgical exploration.

(Choice A) Appropriate wound dressing and tight glucose control play a key role in adequate surgical wound healing in diabetics. However, once infection is established, definitive therapy with surgical exploration and antibiotic therapy is needed.

(Choice B) Negative-pressure wound therapy (ie, vacuum-assisted wound closure) is a wound-dressing system that applies sub-atmospheric pressure to a wound to accelerate the healing process. It is reserved for healthy, granulating wounds. It is not used initially when the wound is infected or necrotic.

(Choice C) Intravenous antibiotics alone are sufficient therapy for wound infections limited to cellulitis, but surgical debridement is required when the infection penetrates the deeper skin layers and adjacent tissue, as in this patient.

(Choice E) Topical antimicrobial agents do not have a clear role in surgical site infections. They are not useful for prevention as they may inhibit wound healing, and they are not a substitute for parenteral therapy once infection has been established.

Educational objective:

Necrotizing surgical infection is characterized by intense pain in the wound, decreased sensitivity at the edges of the wound, cloudy-gray discharge, and sometimes crepitus. Early surgical exploration is essential.

References

- [Necrotizing soft tissue infection: diagnosis and management](#)

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condition is early **surgical exploration** to assess the extent of the process and debride necrotic tissues. Adjunctive therapies, including broad-spectrum antibiotics, adequate hydration, and tight glycemic control, are also important but are secondary to surgical exploration.

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Educational objective:

Necrotizing surgical infection is characterized by intense pain in the wound, decreased sensitivity at the edges of the wound, cloudy-gray discharge, and sometimes crepitus. Early surgical exploration is essential.

References

- [Necrotizing soft-tissue infection: diagnosis and management](#)
- [Necrotizing soft tissue infections.](#)
- [Morbidity and mortality of diabetes with surgery.](#)

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A 60-year-old man comes to the emergency department due to 2 days of right calf pain, swelling, and difficulty bearing weight on his right leg. He has no chest pain, shortness of breath, lightheadedness, or syncope. Four weeks ago, the patient was treated with antibiotics and underwent left hemicolectomy for recurrent diverticulitis. He had an unremarkable postoperative course and was discharged from the hospital 2 weeks ago. His other medical problems include type 2 diabetes mellitus, hypertension, and end-stage renal disease on hemodialysis. The patient does not use tobacco, alcohol, or illicit drugs. He has no family history of heart disease, sudden cardiac death, or blood clots. Temperature is 36.8 C (98.2 F), blood pressure is 120/70 mm Hg, pulse is 92/min, and respirations are 14/min. The right calf has moderate ankle edema and is larger than the left calf; there is right calf pain with dorsiflexion of the foot. Duplex ultrasonography shows a non-compressible right femoral vein. Which of the following is the most appropriate next step in management of this patient?

- ☐ A. Aspirin
- ☐ B. Inferior vena cava filter placement
- ☐ C. Low molecular weight heparin only
- ☐ D. Low molecular weight heparin followed by warfarin
- ☐ E. Rivaroxaban
- ☐ F. Unfractionated heparin only
- ☐ G. Unfractionated heparin followed by warfarin
- ☐ H. Warfarin

Submit

A 60-year-old man comes to the emergency department due to 2 days of right calf pain, swelling, and difficulty bearing weight on his right leg. He has no chest pain, shortness of breath, lightheadedness, or syncope. Four weeks ago, the patient was treated with antibiotics and underwent left hemicolectomy for recurrent diverticulitis. He had an unremarkable postoperative course and was discharged from the hospital 2 weeks ago. His other medical problems include type 2 diabetes mellitus, hypertension, and end-stage renal disease on hemodialysis. The patient does not use tobacco, alcohol, or illicit drugs. He has no family history of heart disease, sudden cardiac death, or blood clots. Temperature is 36.8 C (98.2 F), blood pressure is 120/70 mm Hg, pulse is 92/min, and respirations are 14/min. The right calf has moderate ankle edema and is larger than the left calf; there is right calf pain with dorsiflexion of the foot. Duplex ultrasonography shows a non-compressible right femoral vein. Which of the following is the most appropriate next step in management of this patient?

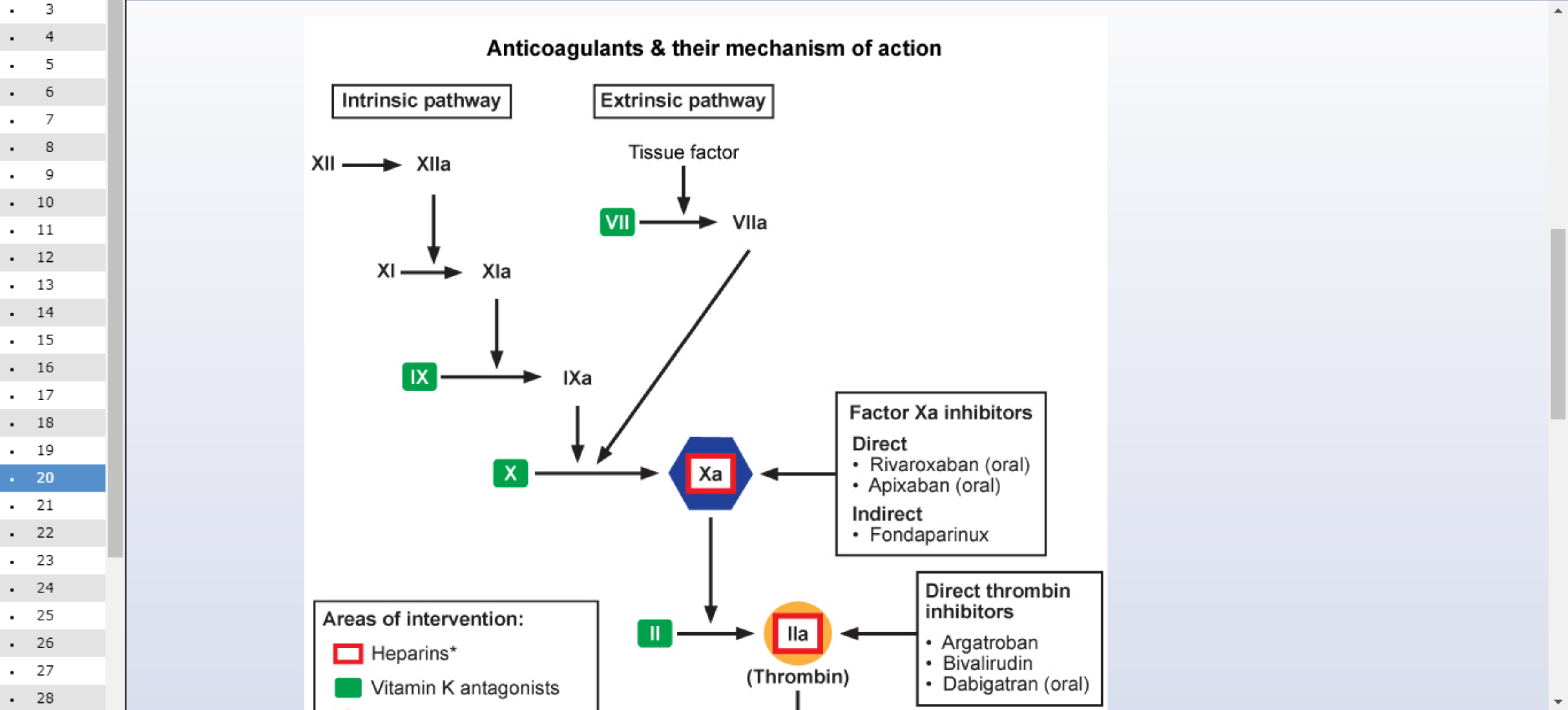
- ☐ A. Aspirin (1%)
- ☐ B. Inferior vena cava filter placement (13%)
- ☐ C. Low molecular weight heparin only (19%)
- ☐ D. Low molecular weight heparin followed by warfarin (19%)
- ☐ E. Rivaroxaban (5%)
- ☐ F. Unfractionated heparin only (16%)
- ☒ G. Unfractionated heparin followed by warfarin (23%)
- ☐ H. Warfarin (1%)

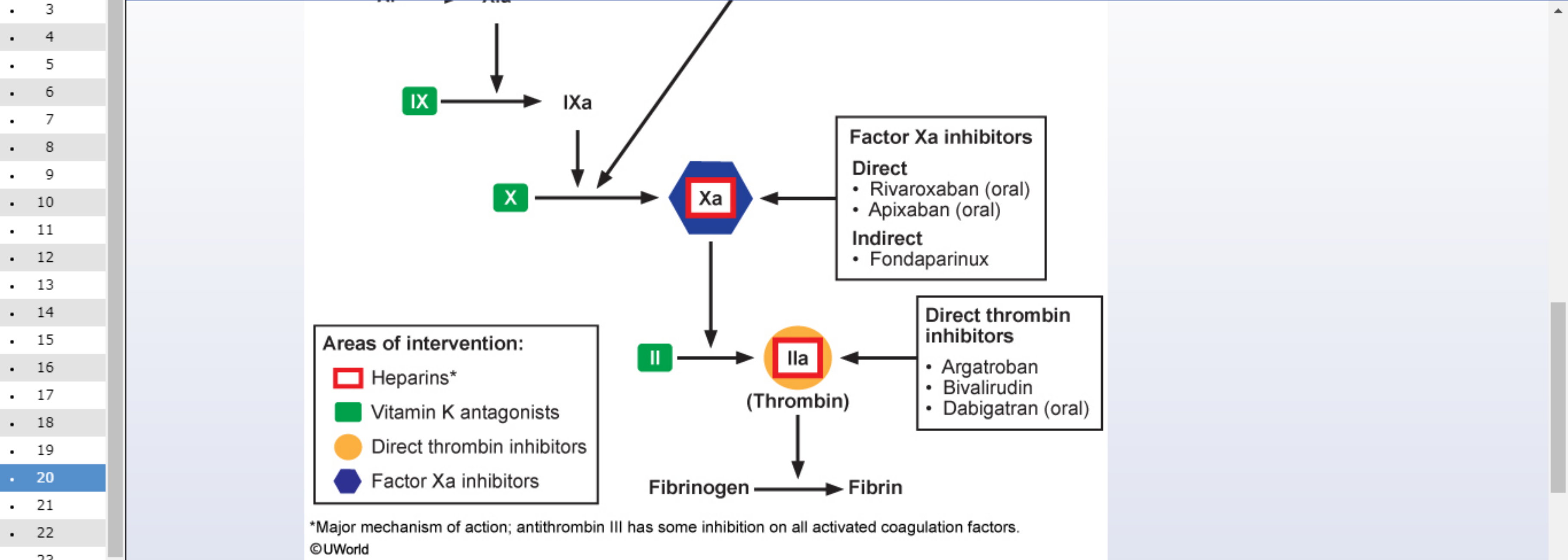
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Correct answer
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23%
Answered correctly

02 secs
Time Spent

01/13/2020
Last Updated





This patient has a provoked **deep vein thrombosis** (DVT) due to recent surgery. Treatment with anticoagulation can prevent extension of the thrombus, acute pulmonary embolism, and possible development of future thrombus. Provoked DVT due to recent surgery will likely require at least 3 months of treatment.

Warfarin is the preferred long-term oral anticoagulant in end-stage **renal disease** patients. It inhibits the synthesis of the vitamin K-dependent clotting factors II, VII, IX, and X and anticoagulant proteins C and S. Warfarin takes several days to become therapeutic and first acts on proteins

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This patient has a provoked **deep vein thrombosis** (DVT) due to recent surgery. Treatment with anticoagulation can prevent extension of the thrombus, acute pulmonary embolism, and possible development of future thrombus. Provoked DVT due to recent surgery will likely require at least 3 months of treatment.

Warfarin is the preferred long-term oral anticoagulant in end-stage **renal disease** patients. It inhibits the synthesis of the vitamin K-dependent clotting factors II, VII, IX, and X and anticoagulant proteins C and S. Warfarin takes several days to become therapeutic and first acts on proteins C and S, causing a transient prothrombotic state; as a result, it generally cannot be started alone (**Choice H**). This patient therefore will need to be started on intravenous **unfractionated heparin** for immediate treatment of the DVT (as it acts quickly) and then on warfarin (typically in the evening of the same day). Heparin is continued for 4-5 days until the INR is at therapeutic levels (goal 2–3).

(Choice A) Aspirin has no role in the treatment of confirmed DVT as it is a platelet inhibitor and does not modify the coagulation cascade.

(Choice B) Starting anticoagulation in a hemodynamically stable patient 48-72 hours after surgery is generally safe and does not significantly increase the risk of bleeding. Inferior vena cava filters can be used in patients in whom anticoagulation is contraindicated (eg, massive gastrointestinal bleed, hemorrhagic stroke).

(Choices C, D, and E) Both low molecular weight heparin (eg, enoxaparin) and rivaroxaban are not recommended in end-stage renal disease (ESRD); they are metabolized by the kidney, so their use in patients with ESRD is associated with increased bleeding risk. Intravenous unfractionated heparin is not contraindicated in ESRD.

(Choice F) Unfractionated heparin would generally not be started alone as it is an intravenous medication and needs to be continued until the INR is therapeutic, which can take several days. The goal is to discharge the patient on oral warfarin quickly.

Educational objective:

Major surgery is a significant risk factor for deep venous thrombosis (DVT). At least 3 months of anticoagulation is recommended for provoked DVT. Stable patients can be treated with anticoagulation as early as 48-72 hours after surgery. Patients started on warfarin must be started on an additional anticoagulant (eg, heparin) at the same time because warfarin temporarily causes a prothrombotic state. Low molecular weight heparin is not recommended in end-stage renal disease.

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be started on intravenous **unfractionated heparin** for immediate treatment of the DVT (as it acts quickly) and then on warfarin (typically in the evening of the same day). Heparin is continued for 4-5 days until the INR is at therapeutic levels (goal 2–3).

(Choice A) Aspirin has no role in the treatment of confirmed DVT as it is a platelet inhibitor and does not modify the coagulation cascade.

(Choice B) Starting anticoagulation in a hemodynamically stable patient 48-72 hours after surgery is generally safe and does not significantly increase the risk of bleeding. Inferior vena cava filters can be used in patients in whom anticoagulation is contraindicated (eg, massive gastrointestinal bleed, hemorrhagic stroke).

(Choices C, D, and E) Both low molecular weight heparin (eg, enoxaparin) and rivaroxaban are not recommended in end-stage renal disease (ESRD); they are metabolized by the kidney, so their use in patients with ESRD is associated with increased bleeding risk. Intravenous unfractionated heparin is not contraindicated in ESRD.

(Choice F) Unfractionated heparin would generally not be started alone as it is an intravenous medication and needs to be continued until the INR is therapeutic, which can take several days. The goal is to discharge the patient on oral warfarin quickly.

Educational objective:

Major surgery is a significant risk factor for deep venous thrombosis (DVT). At least 3 months of anticoagulation is recommended for provoked DVT. Stable patients can be treated with anticoagulation as early as 48-72 hours after surgery. Patients started on warfarin must be started on an additional anticoagulant (eg, heparin) at the same time because warfarin temporarily causes a prothrombotic state. Low molecular weight heparin is not recommended in end-stage renal disease.

References

- [The perioperative management of antithrombotic therapy: American College of Chest Physicians evidence-based clinical practice guidelines \(8th edition\).](#)

Surgery

Hematology & Oncology

Venous thromboembolism

Subject

System

Topic

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A 28-year-old man is brought to the emergency department due to a construction site accident in which a heavy concrete slab fell on his legs. The patient was trapped from the waist down for about 15 minutes until other workers were able to rescue him. He sustained no injury to the head or upper torso and did not lose consciousness. The patient has no significant medical history and takes no medications. He drinks 1 or 2 beers daily but does not use tobacco or illicit drugs. Blood pressure is 140/90 mm Hg, and pulse is 110/min. Bilateral breath sounds are equal and normal. Heart sounds are not muffled. The abdomen is soft and nontender. There are obvious deformities, abrasions, and lacerations on both lower limbs. Radiographs reveal multiple bilateral lower extremity fractures. After the patient is cleared of other major trauma, he is taken for surgical stabilization and fixation of the lower extremity fractures. Succinylcholine is considered for rapid-sequence intubation. With the use of succinylcholine, this patient is at greatest risk for which of the following?

- ☐ A. Acute liver failure due to toxic drug intermediaries
- ☐ B. Adrenal insufficiency due to 11 β -hydroxylase inhibition
- ☐ C. Cardiac arrhythmia due to electrolyte derangement
- ☐ D. Neurotoxicity due to methionine synthase inhibition
- ☐ E. Severe hypotension due to myocardial depression

Submit

A 28-year-old man is brought to the emergency department due to a construction site accident in which a heavy concrete slab fell on his legs. The patient was trapped from the waist down for about 15 minutes until other workers were able to rescue him. He sustained no injury to the head or upper torso and did not lose consciousness. The patient has no significant medical history and takes no medications. He drinks 1 or 2 beers daily but does not use tobacco or illicit drugs. Blood pressure is 140/90 mm Hg, and pulse is 110/min. Bilateral breath sounds are equal and normal. Heart sounds are not muffled. The abdomen is soft and nontender. There are obvious deformities, abrasions, and lacerations on both lower limbs. Radiographs reveal multiple bilateral lower extremity fractures. After the patient is cleared of other major trauma, he is taken for surgical stabilization and fixation of the lower extremity fractures. Succinylcholine is considered for rapid-sequence intubation. With the use of succinylcholine, this patient is at greatest risk for which of the following?

- ☐ A. Acute liver failure due to toxic drug intermediaries (10%)
- ☐ B. Adrenal insufficiency due to 11 β -hydroxylase inhibition (1%)
- ☒ C. Cardiac arrhythmia due to electrolyte derangement (57%)
- ☐ D. Neurotoxicity due to methionine synthase inhibition (8%)
- ☐ E. Severe hypotension due to myocardial depression (22%)

Omitted

Correct answer C

57% Answered correctly

01 sec Time Spent

06/01/2020 Last Updated

Explanation

Succinylcholine is a **depolarizing** neuromuscular blocker that works by binding to postsynaptic acetylcholine receptors to trigger influx of sodium ions and efflux of potassium ions through ligand-gated ion channels; depolarization occurs and temporary paralysis ensues (delayed).

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Succinylcholine is a **depolarizing** neuromuscular blocker that works by binding to postsynaptic acetylcholine receptors to trigger influx of sodium ions and **efflux of potassium ions** through ligand-gated ion channels; depolarization occurs and temporary paralysis ensues (delayed repolarization of the skeletal muscle membrane). Succinylcholine is often used during rapid-sequence intubation as it has a rapid onset (45-60 seconds) and offset (6-10 minutes) of action. However, in certain patients it can cause life-threatening **cardiac arrhythmia** due to **severe hyperkalemia**.

This patient has experienced an extensive skeletal muscle crush injury, which places him at risk for hyperkalemia due to skeletal muscle cell lysis (rhabdomyolysis). In addition, skeletal muscle injury leads to **upregulation of postsynaptic acetylcholine receptors**, which can result in massive efflux of potassium following administration of succinylcholine. Other relevant conditions that cause upregulation of acetylcholine receptors include burn injury, disuse muscle atrophy, and denervation (eg, stroke, Guillain-Barré syndrome, critical illness polyneuropathy). To avoid life-threatening hyperkalemia in such settings, **nondepolarizing neuromuscular blocking agents** (eg, vecuronium, rocuronium) should be used as they do not affect postsynaptic ligand-gated ion channels.

(Choice A) Halothane can lead to acute liver failure due to production of hepatotoxic intermediary compounds; therefore, it is now rarely used. Adult women are at greatest risk of developing halothane-associated liver toxicity.

(Choice B) Etomidate inhibits 11 β -hydroxylase and can lead to adrenal insufficiency. The elderly and patients with critical illness (eg, sepsis) are typically susceptible.

(Choice D) Nitrous oxide inactivates vitamin B₁₂, leading to inhibition of methionine synthase activity; subsequent neurotoxicity (eg, peripheral neuropathy) can result in patients with preexisting vitamin B₁₂ deficiency.

(Choice E) Severe hypotension due to myocardial depression is a common adverse effect of propofol. Therefore, propofol should be avoided or used with extreme caution in patients with ventricular systolic dysfunction.

Educational objective:

Succinylcholine is a depolarizing neuromuscular blocker that can cause life-threatening hyperkalemia in patients with a condition leading to upregulation of postsynaptic acetylcholine receptors (eg, skeletal muscle trauma, burn injury, stroke). Nondepolarizing neuromuscular blocking agents (eg, vecuronium, rocuronium) should be used with these patients.

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(rhabdomyolysis). In addition, skeletal muscle injury leads to **upregulation of postsynaptic acetylcholine receptors**, which can result in massive efflux of potassium following administration of succinylcholine. Other relevant conditions that cause upregulation of acetylcholine receptors include burn injury, disuse muscle atrophy, and denervation (eg, stroke, Guillain-Barré syndrome, critical illness polyneuropathy). To avoid life-threatening hyperkalemia in such settings, **nondepolarizing neuromuscular blocking agents** (eg, vecuronium, rocuronium) should be used as they do not affect postsynaptic ligand-gated ion channels.

(Choice A) Halothane can lead to acute liver failure due to production of hepatotoxic intermediary compounds; therefore, it is now rarely used. Adult women are at greatest risk of developing halothane-associated liver toxicity.

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(Choice E) Severe hypotension due to myocardial depression is a common adverse effect of propofol. Therefore, propofol should be avoided or used with extreme caution in patients with ventricular systolic dysfunction.

Educational objective:
Succinylcholine is a depolarizing neuromuscular blocker that can cause life-threatening hyperkalemia in patients with a condition leading to upregulation of postsynaptic acetylcholine receptors (eg, skeletal muscle trauma, burn injury, stroke). Nondepolarizing neuromuscular blocking agents (eg, vecuronium, rocuronium) should be used with these patients.

References

- [Succinylcholine-induced hyperkalemia in acquired pathologic states: etiologic factors and molecular mechanisms.](#)

Surgery	Rheumatology/Orthopedics & Sports	Hyperkalemia
Subject	System	Topic

A 50-year-old woman comes to the emergency department with 2 days of abdominal pain, nausea, and vomiting. The pain was initially intermittent, coming in waves, but over the past 6 hours it has become severe and continuous. She has vomited 3 times over the last several hours but has not passed gas or had a bowel movement for the last 3 days. The patient's medical history is notable only for a large benign ovarian cyst, which was removed 10 years ago. Temperature is 38.5 C (101.3 F), blood pressure is 91/64 mm Hg, pulse is 122/min, and respirations are 24/min. Pulse oximetry shows 97% on room air. Mucous membranes are dry. Cardiopulmonary examination shows tachycardia but no abnormalities. The abdomen is distended, tympanic, and tender to palpation in all 4 quadrants. There is mild guarding and bowel sounds are decreased. Digital rectal examination shows no stool in the rectal vault. Laboratory results are as follows:

Hemoglobin	14.0 g/dL
Leukocytes	14,300/mm ³
Blood glucose	70 mg/dL
Blood urea nitrogen	36 mg/dL
HCO ₃	15 mEq/L
Serum amylase	120 U/L

Plain abdominal x-ray shows distended loops of small bowel with air-fluid levels. A nasogastric tube is placed. In addition to intravenous fluids and analgesics, which of the following is the best next step in management?

- ☐ A. Broad-spectrum antibiotics and serial abdominal x-rays
- ☐ B. Contrast (barium) enema
- ☐ C. Magnetic resonance angiography of the mesenteric vessels
- ☐ D. Rectal tube placement

are decreased. Digital rectal examination shows no stool in the rectal vault. Laboratory results are as follows:

Hemoglobin	14.0 g/dL
Leukocytes	14,300/mm ³
Blood glucose	70 mg/dL
Blood urea nitrogen	36 mg/dL
HCO ₃	15 mEq/L
Serum amylase	120 U/L

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- ☐ A. Broad-spectrum antibiotics and serial abdominal x-rays
- ☐ B. Contrast (barium) enema
- ☐ C. Magnetic resonance angiography of the mesenteric vessels
- ☐ D. Rectal tube placement
- ☐ E. Small-bowel follow-through series
- ☐ F. Urgent surgical exploration

Submit

are decreased. Digital rectal examination shows no stool in the rectal vault. Laboratory results are as follows:

Hemoglobin	14.0 g/dL
Leukocytes	14,300/mm ³
Blood glucose	70 mg/dL
Blood urea nitrogen	36 mg/dL
HCO ₃	15 mEq/L
Serum amylase	120 U/L

Plain abdominal x-ray shows distended loops of small bowel with air-fluid levels. A nasogastric tube is placed. In addition to intravenous fluids and analgesics, which of the following is the best next step in management?

- ☐ A. Broad-spectrum antibiotics and serial abdominal x-rays (23%)
- ☐ B. Contrast (barium) enema (7%)
- ☐ C. Magnetic resonance angiography of the mesenteric vessels (2%)
- ☐ D. Rectal tube placement (1%)
- ☐ E. Small-bowel follow-through series (11%)
- ☒ F. Urgent surgical exploration (53%)

Omitted

Correct answer

53% Answered correctly

05 secs Time Spent

05/04/2020 Last Updated

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Small-bowel obstruction	
Clinical presentation	- Colicky abdominal pain, vomiting - Inability to pass flatus or stool if complete (no obstipation if partial) - Hyperactive → absent bowel sounds - Distended & tympanitic abdomen
Diagnosis	- Dilated loops of bowel with air-fluid levels on plain film or CT scan - Partial: air in colon - Complete: transition point (abrupt cutoff), no air in colon
Complications	- Ischemia/necrosis (strangulation) - Bowel perforation
Management	- Bowel rest, nasogastric tube suction, intravenous fluids - Surgical exploration for signs of complications

This patient's presentation is consistent with complicated small-bowel obstruction (SBO). Patients with SBO typically present with colicky abdominal pain, vomiting, inability to pass flatus or stool, abdominal distension, and diffuse tenderness. A history of prior abdominal surgery is an important risk factor due to adhesion development. Increased pain and hyperactive bowel sounds are sometimes noted during a peristaltic rush; however, as the SBO progresses, sounds may become diminished and if ischemia occurs they may disappear altogether. Depending on the level of obstruction, abdominal radiographs can reveal dilated loops of bowel with multiple air-fluid levels. Mild leukocytosis and amylase elevation can also be seen.

Most patients with SBO can be managed initially with conservative measures (eg, bowel rest, nasogastric tube suction, correction of metabolic derangements). However, this patient has several findings that indicate a **complicated SBO** with increased risk of impending ischemia, strangulation, and necrosis, warranting **emergency abdominal exploration**. These findings include changes in the character of the pain, **fever**, **hemodynamic instability** (hypotension, tachycardia), guarding, leukocytosis, and significant **metabolic acidosis** (low bicarbonate in this patient). Delay in surgery may lead to perforation and significant risk of mortality.

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Surgical exploration for signs of complications

This patient's presentation is consistent with complicated small-bowel obstruction (SBO). Patients with SBO typically present with colicky abdominal pain, vomiting, inability to pass flatus or stool, abdominal distension, and diffuse tenderness. A history of prior abdominal surgery is an important risk factor due to adhesion development. Increased pain and hyperactive bowel sounds are sometimes noted during a peristaltic rush; however, as the SBO progresses, sounds may become diminished and if ischemia occurs they may disappear altogether. Depending on the level of obstruction, abdominal radiographs can reveal dilated loops of bowel with multiple air-fluid levels. Mild leukocytosis and amylase elevation can also be seen.

Most patients with SBO can be managed initially with conservative measures (eg, bowel rest, nasogastric tube suction, correction of metabolic derangements). However, this patient has several findings that indicate a **complicated SBO** with increased risk of impending ischemia, strangulation, and necrosis, warranting **emergency abdominal exploration**. These findings include changes in the character of the pain, **fever**, **hemodynamic instability** (hypotension, tachycardia), guarding, leukocytosis, and significant **metabolic acidosis** (low bicarbonate in this patient). Delay in surgery may lead to perforation and significant risk of mortality.

(Choice A) Antibiotics should not be used in patients with uncomplicated SBO. Patients (such as this one) who have a complicated SBO with suspected strangulation have increased risk of intestinal bacterial translocation and sepsis; broad-spectrum antibiotics can reduce infection risk. However, antibiotics and observation (with serial x-rays) alone would not be appropriate for this patient given her clinical deterioration (eg, worsening pain, fever, acidosis).

(Choices B and E) Barium enema is not a useful diagnostic test in patients with suspected SBO. Small-bowel follow-through can help diagnose partial intestinal obstruction in clinically stable patients who do not respond completely to initial conservative management.

(Choice C) Acute mesenteric ischemia may present with similar signs and symptoms, including severe pain, vomiting, distension, decreased bowel sounds, and peritonitis. However, obstipation and air-fluid levels are more characteristic of SBO. CT angiography is the preferred imaging choice for acute mesenteric ischemia.

(Choice D) Colonic pseudo-obstruction (obstruction without a mechanical cause) may also present with pain, distension, and vomiting; however, imaging would instead show a dilated colon.

Educational objective:

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Most patients with SBO can be managed initially with conservative measures (eg, bowel rest, nasogastric tube suction, correction of metabolic derangements). However, this patient has several findings that indicate a **complicated SBO** with increased risk of impending ischemia, strangulation, and necrosis, warranting **emergency abdominal exploration**. These findings include changes in the character of the pain, **fever**, **hemodynamic instability** (hypotension, tachycardia), guarding, leukocytosis, and significant **metabolic acidosis** (low bicarbonate in this patient). Delay in surgery may lead to perforation and significant risk of mortality.

(Choice A) Antibiotics should not be used in patients with uncomplicated SBO. Patients (such as this one) who have a complicated SBO with suspected strangulation have increased risk of intestinal bacterial translocation and sepsis; broad-spectrum antibiotics can reduce infection risk. However, antibiotics and observation (with serial x-rays) alone would not be appropriate for this patient given her clinical deterioration (eg, worsening pain, fever, acidosis).

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(Choice D) Colonic pseudo-obstruction (obstruction without a mechanical cause) may also present with pain, distension, and vomiting; however, imaging would instead show a dilated colon.

Educational objective:

Immediate surgical intervention is indicated for patients with intestinal obstruction who develop clinical or hemodynamic instability, fail to improve after initial conservative measures, and/or develop symptoms or signs of ischemia or necrosis.

References

- Adhesive small bowel adhesions obstruction: evolutions in diagnosis, management and prevention.
- Adult small bowel obstruction.

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Settings

A 29-year-old man comes to the office due to difficulty swallowing for the past 2 years. Pork, chicken, and steak occasionally "get stuck" in his mid-chest seconds after he swallows. These episodes occur intermittently but with increasing frequency. Drinking water usually alleviates the symptoms, but the patient occasionally induces vomiting to eject the food. He has no trouble swallowing water, broth, or gelatin. The patient has no pain, cough, or nasal regurgitation after swallowing. He frequently plays football and takes ibuprofen to relieve aches and pains. He has seasonal allergies and takes antihistamines during the spring. Temperature is 37.3 C (99.1 F), blood pressure is 125/78 mm Hg, pulse is 76/min, and respirations are 12/min. BMI is 28 kg/m². Heart and lung sounds are unremarkable. The abdomen is soft, nontender, and nondistended. Which of the following is the most likely explanation for this patient's symptoms?

- ☐ A. Achalasia
- ☐ B. Eosinophilic esophagitis
- ☐ C. Esophageal cancer
- ☐ D. Herpes esophagitis
- ☐ E. Myasthenia gravis
- ☐ F. Pill esophagitis

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A 29-year-old man comes to the office due to difficulty swallowing for the past 2 years. Pork, chicken, and steak occasionally "get stuck" in his mid-chest seconds after he swallows. These episodes occur intermittently but with increasing frequency. Drinking water usually alleviates the symptoms, but the patient occasionally induces vomiting to eject the food. He has no trouble swallowing water, broth, or gelatin. The patient has no pain, cough, or nasal regurgitation after swallowing. He frequently plays football and takes ibuprofen to relieve aches and pains. He has seasonal allergies and takes antihistamines during the spring. Temperature is 37.3 C (99.1 F), blood pressure is 125/78 mm Hg, pulse is 76/min, and respirations are 12/min. BMI is 28 kg/m². Heart and lung sounds are unremarkable. The abdomen is soft, nontender, and nondistended. Which of the following is the most likely explanation for this patient's symptoms?

- ☐ A. Achalasia (32%)
- ☒ B. Eosinophilic esophagitis (46%)
- ☐ C. Esophageal cancer (3%)
- ☐ D. Herpes esophagitis (0%)
- ☐ E. Myasthenia gravis (1%)
- ☐ F. Pill esophagitis (16%)

Omitted

Correct answer B

46% Answered correctly

01 sec Time Spent

04/26/2020 Last Updated

Explanation

Eosinophilic esophagitis	
Pathogenesis	Chronic, immune-mediated esophageal inflammation
Clinical features	- Dysphagia - Chest/epigastric pain - Reflux/vomiting - Food impaction - Associated atopy
Diagnosis	Endoscopy & esophageal biopsy (≥15 eosinophils per high-power field)
Treatment	- Dietary modification ± Topical glucocorticoids

Dysphagia (difficulty swallowing) is categorized as either oropharyngeal (difficulty initiating a swallow, with coughing/choking after eating) or esophageal (sensation of food stuck in the esophagus). Esophageal dysphagia to both solids and liquids indicates a motility disorder, with intermittent (eg, esophageal spasm) or progressive (eg, achalasia) symptoms depending on the underlying condition. Esophageal dysphagia to solids generally reflects mechanical obstruction; symptoms can also be progressive (eg, from solids to liquids), which suggests a developing stricture or cancer, or intermittent.

Eosinophilic esophagitis (EoE), which most commonly affects **younger men** (age 20-30) and is associated with other atopic conditions (eg, asthma, eczema), classically presents with **intermittent solid food dysphagia** (often associated with eating meat) due to extensive eosinophilic infiltration of the mucosa. Other common manifestations include symptoms of refractory gastroesophageal reflux and chest/upper abdominal pain. If not recognized early, EoE can progress to fibrosis, leading to esophageal strictures that result in progressive dysphagia and **food impaction**.

The endoscopic appearance of EoE includes furrowing; small, whitish exudates; and multiple stacked, ringlike esophageal indentations ([trachealization of the esophagus](#)). The diagnosis is confirmed with esophageal biopsy demonstrating **≥15 eosinophils per high-power field**. Management includes **dietary therapy** (eg, allergen avoidance, elimination diet), proton pump inhibitors, and **topical glucocorticoids** (eg,

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Dysphagia (difficulty swallowing) is categorized as either oropharyngeal (difficulty initiating a swallow, with coughing/choking after eating) or esophageal (sensation of food stuck in the esophagus). Esophageal dysphagia to both solids and liquids indicates a motility disorder, with intermittent (eg, esophageal spasm) or progressive (eg, achalasia) symptoms depending on the underlying condition. Esophageal dysphagia to solids generally reflects mechanical obstruction; symptoms can also be progressive (eg, from solids to liquids), which suggests a developing stricture or cancer, or intermittent.

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The endoscopic appearance of EoE includes furrowing; small, whitish exudates; and multiple stacked, ringlike esophageal indentations ([trachealization of the esophagus](#)). The diagnosis is confirmed with esophageal biopsy demonstrating **≥15 eosinophils per high-power field**. Management includes **dietary therapy** (eg, allergen avoidance, elimination diet), proton pump inhibitors, and **topical glucocorticoids** (eg, fluticasone, budesonide).

(Choice A) Achalasia results from the degeneration of myenteric plexuses in the esophagus, which prevents the lower esophageal sphincter from fully relaxing. Dysphagia is typically progressive (rather than intermittent) and involves both solids and liquids.

(Choice C) Esophageal cancer typically causes a slowly progressive, rather than an intermittent, dysphagia. In addition, it is typically associated with unintended weight loss and is rare in patients in their 20s.

(Choice D) Herpes esophagitis is more commonly associated with odynophagia, retrosternal chest pain, and fever than it is with dysphagia; typically occurs in immunocompromised patients (eg, HIV, organ transplant); and often causes concurrent oral ulcerations or herpes labialis.

(Choice E) Myasthenia gravis can affect the bulbar muscles, which can lead to oropharyngeal rather than esophageal dysphagia.

(Choice F) Ibuprofen is associated with pill esophagitis, which can result in dysphagia, but also typically causes retrosternal chest pain and severe odynophagia. Patients may be unable to swallow saliva due to pain.

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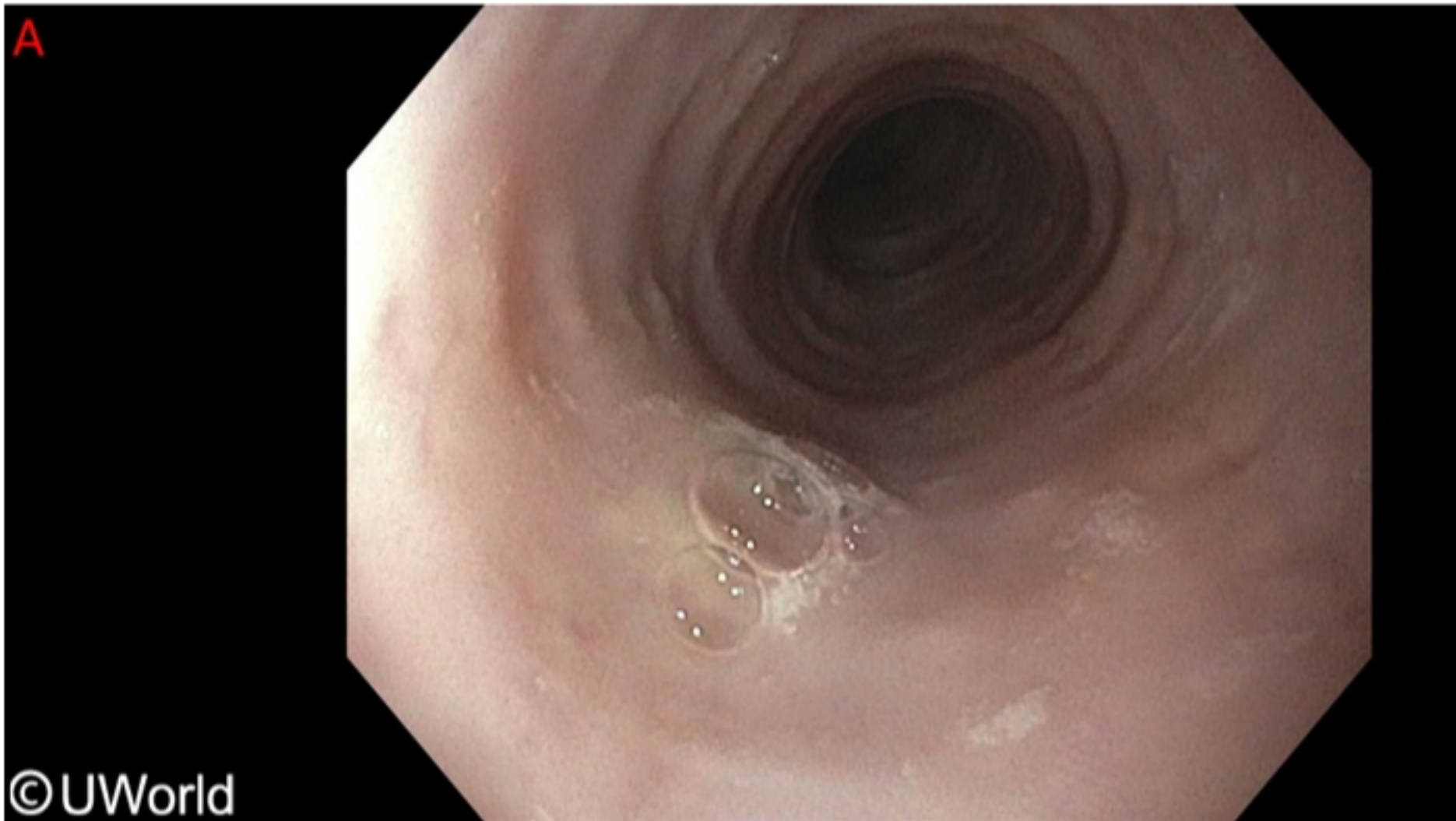
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Exhibit Display



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severe odynophagia. Patients may be unable to swallow saliva due to pain.

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pain. If not recognized early, EoE can progress to fibrosis, leading to esophageal strictures that result in progressive dysphagia and food

impaction.

The endoscopic appearance of EoE includes furrowing; small, whitish exudates; and multiple stacked, ringlike esophageal indentations ([trachealization of the esophagus](#)). The diagnosis is confirmed with esophageal biopsy demonstrating **≥15 eosinophils per high-power field**. Management includes **dietary therapy** (eg, allergen avoidance, elimination diet), proton pump inhibitors, and **topical glucocorticoids** (eg, fluticasone, budesonide).

(Choice A) Achalasia results from the degeneration of myenteric plexuses in the esophagus, which prevents the lower esophageal sphincter from fully relaxing. Dysphagia is typically progressive (rather than intermittent) and involves both solids and liquids.

(Choice C) Esophageal cancer typically causes a slowly progressive, rather than an intermittent, dysphagia. In addition, it is typically associated with unintended weight loss and is rare in patients in their 20s.

(Choice D) Herpes esophagitis is more commonly associated with odynophagia, retrosternal chest pain, and fever than it is with dysphagia; typically occurs in immunocompromised patients (eg, HIV, organ transplant); and often causes concurrent oral ulcerations or herpes labialis.

(Choice E) Myasthenia gravis can affect the bulbar muscles, which can lead to oropharyngeal rather than esophageal dysphagia.

(Choice F) Ibuprofen is associated with pill esophagitis, which can result in dysphagia, but also typically causes retrosternal chest pain and severe odynophagia. Patients may be unable to swallow saliva due to pain.

Educational objective:

Eosinophilic esophagitis usually presents as intermittent solid food dysphagia and most commonly affects younger men with atopic conditions. Untreated disease can cause esophageal stricture and food impaction. Management includes dietary therapy (eg, allergen avoidance, elimination diet), proton pump inhibitors, and topical glucocorticoids (eg, fluticasone, budesonide).

Surgery

Gastrointestinal & Nutrition

Esophagitis

Subject

System

Topic

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Settings

A 7-year-old girl is brought to the emergency department due to a cat bite on her right arm. She was bitten while picking up a neighbor's cat by its tail. Afterward, her mother immediately cleaned the wound with hydrogen peroxide. The patient's vaccinations are up to date, and her most recent tetanus vaccine was 3 years ago. Her temperature is 36.9 C (98.4 F), blood pressure is 108/70 mm Hg, pulse is 107/min, and respirations are 21/min. Physical examination shows a deep puncture wound on the anterolateral aspect of her right forearm. There is no visible debris in the wound and no active bleeding. Neurovascular function is intact. Her wound is copiously irrigated with saline and cleaned with povidone-iodine. Which of the following is the best next step in management?

- ☐ A. Administer tetanus booster
- ☐ B. Closure with sutures
- ☐ C. Observation and close follow-up
- ☐ D. Prescribe amoxicillin/clavulanate
- ☐ E. Prescribe azithromycin
- ☐ F. Prescribe clindamycin

Submit



TUTOR



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End Block

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- ☐ A. Administer tetanus booster (4%)
- ☐ B. Closure with sutures (2%)
- ☐ C. Observation and close follow-up (26%)
- ☒ D. Prescribe amoxicillin/clavulanate (51%)
- ☐ E. Prescribe azithromycin (7%)
- ☐ F. Prescribe clindamycin (7%)

Omitted

Correct answer D

51% Answered correctly

01 sec Time Spent

05/13/2020 Last Updated

Explanation

Cat bites

Cat bites	
Microbiology	<i>Pasteurella multocida</i> - Anaerobic bacteria
Management	- Copious irrigation & cleaning - Prophylactic amoxicillin/clavulanate - Tetanus booster as indicated - Avoid closure

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This patient has a deep **puncture wound** from a **cat bite**. Cats have long, sharp teeth that can inoculate oral flora deep into skin, reaching soft-tissue structures (eg, nerves, tendon sheaths). Therefore, cat bites are much more likely to cause serious infection than dog or human bites, and **antibiotic prophylaxis** is recommended in addition to routine wound care (eg, copious irrigation). Oral flora of cats includes *Pasteurella multocida* (gram-negative coccobacilli) and oral anaerobes. **Amoxicillin/clavulanate** is the agent of choice for prophylaxis; amoxicillin has activity against *P multocida*, and the addition of clavulanate provides coverage against oral anaerobes.

(Choice A) For cat bites, a booster dose of tetanus-containing vaccine should be administered to incompletely vaccinated children or those whose last vaccine was ≥ 5 years ago. This child's last dose was 3 years ago; therefore, she does not require a booster dose.

(Choice B) Due to the high risk for infection following cat bites, wound closure should be avoided unless there is a major cosmetic implication (eg, facial wound).

(Choice C) Observation and close follow-up without antibiotic prophylaxis are appropriate for immunocompetent individuals with minor human or dog bites that are not located on hands, feet, or genitalia. This treatment would be inappropriate management for cat bites as the majority will become infected without antibiotic prophylaxis.

(Choice E) Azithromycin has activity against *Bartonella henselae*, the causative agent of cat-scratch disease. However, cat-scratch disease is

This patient has a deep **puncture wound** from a **cat bite**. Cats have long, sharp teeth that can inoculate oral flora deep into skin, reaching soft-tissue structures (eg, nerves, tendon sheaths). Therefore, cat bites are much more likely to cause serious infection than dog or human bites, and **antibiotic prophylaxis** is recommended in addition to routine wound care (eg, copious irrigation). Oral flora of cats includes *Pasteurella multocida* (gram-negative coccobacilli) and oral anaerobes. **Amoxicillin/clavulanate** is the agent of choice for prophylaxis; amoxicillin has activity against *P multocida*, and the addition of clavulanate provides coverage against oral anaerobes.

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(Choice C) Observation and close follow-up without antibiotic prophylaxis are appropriate for immunocompetent individuals with minor human or dog bites that are not located on hands, feet, or genitalia. This treatment would be inappropriate management for cat bites as the majority will become infected without antibiotic prophylaxis.

(Choice E) Azithromycin has activity against *Bartonella henselae*, the causative agent of cat-scratch disease. However, cat-scratch disease is uncommon and does not require antibiotic prophylaxis in immunocompetent individuals.

(Choice F) Clindamycin treats gram-positive skin flora (eg, *Staphylococcus aureus*, *Streptococcus pyogenes*) and oral anaerobes. Although clindamycin is commonly used to treat cellulitis and abscesses unrelated to bites, it has no activity against *P multocida* and therefore should not be used as monotherapy for prophylaxis following a cat bite.

Educational objective:

Cat bites are at high risk of infection due to inoculation of bacteria into deep puncture wounds. Amoxicillin with clavulanate has activity against *Pasteurella multocida* and oral anaerobes and is the first-line agent for antibiotic prophylaxis.

References

- [Dog and cat bites.](#)

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Settings

A 34-year-old man is treated in the intensive care unit after being involved in a motorcycle accident. He has multiple injuries, including severe traumatic brain injury. Head CT scan shows areas of contusion and swelling without subdural or epidural hematoma. On the second day of hospitalization, a ventriculostomy is placed for invasive intracranial pressure monitoring. On the third day, his pressure is high despite adequate sedation, elevation of the head of the bed, and removal of cerebrospinal fluid. Hyperventilation would decrease this patient's intracranial pressure by which of the following mechanisms?

- ☐ A. Cerebral vasoconstriction
- ☐ B. Decreased capillary leak
- ☐ C. Decreased sympathetic output
- ☐ D. Increased pO_2
- ☐ E. Increased venous outflow from the head

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-  ☒ A. Cerebral vasoconstriction (83%)
- ☐ B. Decreased capillary leak (1%)
- ☐ C. Decreased sympathetic output (3%)
- ☐ D. Increased pO₂ (4%)
- ☐ E. Increased venous outflow from the head (7%)

Omitted
Correct answer
A

 83%
Answered correctly

 01 sec
Time Spent

 04/05/2020
Last Updated

Explanation

Interventions to reduce intracranial pressure	
↓ Brain parenchymal volume	• Osmotic therapy (eg, hypertonic saline, mannitol) to extract water

Interventions to reduce intracranial pressure	
↓ Brain parenchymal volume	• Osmotic therapy (eg, hypertonic saline, mannitol) to extract water
↓ Cerebral blood volume	• Head elevation to ↑ venous outflow • Sedation to ↓ metabolic demand • Hyperventilation to ↓ PaCO₂, resulting in vasoconstriction
↓ CSF volume	• CSF removal (eg, external ventricular drain)
↑ Cranial volume	• Decompressive craniectomy

CSF = cerebrospinal fluid.

Because the brain is an encased organ, relatively small changes in pressure can alter the **intracranial pressure** in important ways. The pressures in 3 distinct compartments of the brain - the brain parenchyma, the cerebrospinal fluid (CSF), and **cerebral blood flow** (CBF) - determine the overall intracranial pressure (ICP). Both brain parenchyma and CSF have relatively constant pressures except in certain circumstances, including space-occupying lesions and obstructions to CSF flow. CBF is influenced by systemic blood pressure and is held constant over a fairly wide range of pressures by cerebrovascular autoregulation. However, the partial pressures of O₂ and CO₂ also play an important role in regulating CBF. In conditions such as stroke or trauma, these systems are disrupted and interventions may be required to lower ICP.

CBF is an important target for therapy, and **paCO₂** is a potent regulator of CBF (much greater than paO₂). As levels of cerebral paCO₂ rise, so does blood flow. Lowering cerebral arterial paCO₂ through hyperventilation results in rapid **vasoconstriction** and a consequent decrease in ICP.

Other interventions to lower ICP do so by lowering systemic pressures and reducing metabolic demand (sedation), or increasing venous outflow (head elevation), reducing brain parenchyma water content/volume (mannitol), or reducing the volume of CSF (therapeutic lumbar punctures).

(Choice B) The CBF system is tightly regulated and mediated by cerebral vasodilation rather than capillary leak.

(Choice C) Hyperventilation does not significantly affect the sympathetic output of the brain, which is mediated predominantly by pressures in the

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Because the brain is an encased organ, relatively small changes in pressure can alter the **intracranial pressure** in important ways. The pressures in 3 distinct compartments of the brain - the brain parenchyma, the cerebrospinal fluid (CSF), and **cerebral blood flow** (CBF) - determine the overall intracranial pressure (ICP). Both brain parenchyma and CSF have relatively constant pressures except in certain circumstances, including space-occupying lesions and obstructions to CSF flow. CBF is influenced by systemic blood pressure and is held constant over a fairly wide range of pressures by cerebrovascular autoregulation. However, the partial pressures of O₂ and CO₂ also play an important role in regulating CBF. In conditions such as stroke or trauma, these systems are disrupted and interventions may be required to lower ICP.

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(Choice C) Hyperventilation does not significantly affect the sympathetic output of the brain, which is mediated predominantly by pressures in the compartments (eg, brain, CSF, blood).

(Choice D) Ventilatory rate has a much greater effect on arterial pCO₂ than on pO₂, which can be modified by changing the concentration of inhaled oxygen or the end-expiratory pressure in a mechanically ventilated patient.

(Choice E) Increased venous outflow from the head is achieved by elevation of the head rather than hyperventilation.

Educational objective:

Short-term hyperventilation helps lower increased intracranial pressure by causing cerebral washout of CO₂, leading to vasoconstriction and decreased cerebral blood flow.

References

- [Every breath you take: hyperventilation and intracranial pressure.](#)

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Educational objective:

Short-term hyperventilation helps lower increased intracranial pressure by causing cerebral washout of CO₂, leading to vasoconstriction and decreased cerebral blood flow.

References

- Every breath you take: hyperventilation and intracranial pressure.

Surgery

Nervous System

Traumatic brain injury

Subject

System

Topic

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Settings

A 59-year-old man comes to the emergency department due to sudden-onset, severe dyspnea and right-sided chest pain while driving to work. The patient has a history of chronic obstructive pulmonary disease, hypertension, gastroesophageal reflux, and chronic kidney disease. He has smoked a pack of cigarettes daily for 35 years. Blood pressure is 130/80 mm Hg and pulse is 102/min and regular. Pulse oximetry shows 89% on room air. On physical examination, the trachea is midline. Tactile fremitus and breath sounds are decreased on the right, and scattered wheezes are present on the left. No heart murmurs are heard. He has trace ankle edema. Which of the following is the most likely underlying mechanism of this patient's current condition?

- ☐ A. Atelectasis of the right lung
- ☐ B. Diffuse obstruction of the bronchi
- ☐ C. Fluid accumulation in the alveolar spaces
- ☐ D. Fluid transudation into the pleural space
- ☐ E. Inflammatory infiltration of the lung parenchyma
- ☐ F. Rupture of an apical alveolar bleb

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End Block

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- ☐ A. Atelectasis of the right lung (14%)
- ☐ B. Diffuse obstruction of the bronchi (5%)
- ☐ C. Fluid accumulation in the alveolar spaces (7%)
- ☐ D. Fluid transudation into the pleural space (14%)
- ☐ E. Inflammatory infiltration of the lung parenchyma (2%)
- ☒ F. Rupture of an apical alveolar bleb (55%)

Omitted

Correct answer F

55% Answered correctly

02 secs Time Spent

03/09/2020 Last Updated

Explanation

This patient with **chronic obstructive pulmonary disease** (COPD) and acute-onset shortness of breath, hypoxia, and unilaterally decreased breath sounds likely has a **secondary spontaneous pneumothorax** (SSP). SSP occurs in patients with known lung disease (eg, COPD, cystic

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This patient with **chronic obstructive pulmonary disease** (COPD) and acute-onset shortness of breath, hypoxia, and unilaterally decreased breath sounds likely has a **secondary spontaneous pneumothorax** (SSP). SSP occurs in patients with known lung disease (eg, COPD, cystic fibrosis). Other common manifestations include chest pain and hyper-resonance on percussion. Cigarette smoking markedly increases the risk of pneumothorax. Chronic destruction of alveolar sacs leads to the formation of **large alveolar blebs** (red arrow), which can eventually **rupture** and leak air into the pleural space.

Diagnosis of pneumothorax is made by chest x-ray, which demonstrates a visceral pleural line beyond which no pulmonary markings are apparent. Tracheal deviation can occur but is rare (more commonly seen in patients with primary spontaneous pneumothorax). Management depends on the size of the lesion and the clinical status of the patient, and ranges from observation with supplemental oxygen to emergency tube thoracostomy.

(Choice A) Although rapid bronchial occlusion resulting in extensive atelectasis can result in similar symptoms (eg, chest pain, dyspnea, hypoxia), this patient does not have risk factors for obstructive atelectasis such as a history of foreign body aspiration, malignancy, or severe pneumonia (mucus plug). Moreover, extensive atelectasis frequently causes tracheal deviation toward the collapsed lung.

(Choice B) Diffuse bronchial obstruction is seen in an acute COPD exacerbation due to increased production of purulent sputum. Lung examination reveals diffuse rhonchi and wheezing, and symptoms tend to occur more gradually.

(Choice C) Acute causes of pulmonary edema (eg, acute myocardial infarction, acute respiratory distress syndrome) most commonly result in symmetric examination findings (eg, bilateral coarse crackles).

(Choice D) Transudation of pleural fluid can commonly occur in patients with heart, liver, or renal failure. The presence of fluid in the pleural space is characterized by dullness to percussion and decreased breath sounds over the effusion (usually in the lower lung fields), but the symptoms are typically slower to evolve.

(Choice E) Patients with COPD are at increased risk for pneumonia due to chronic inflammation and chronic use of corticosteroids. However, patients with pneumonia typically present with fever and productive cough in addition to chest pain and breathlessness.

Educational objective:

Secondary spontaneous pneumothorax should be suspected in patients with underlying lung disease presenting with rapid worsening of

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(Choice A)

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(Choice C)

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(Choice D)

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(Choice E)

Patients with COPD are at increased risk for pneumonia due to chronic inflammation and chronic use of corticosteroids. However, patients with pneumonia typically present with fever and productive cough in addition to chest pain and breathlessness.

Educational objective:

Secondary spontaneous pneumothorax should be suspected in patients with underlying lung disease presenting with rapid worsening of respiratory symptoms. Rupture of alveolar blebs is the most common cause in patients with chronic obstructive lung disease.

References

Pneumothorax risk factors in smokers with and without chronic obstructive pulmonary disease.

Surgery

Pulmonary & Critical Care

Pneumothorax

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A 15-year-old boy is brought to the emergency department due to abdominal pain that started approximately 24 hours ago and is described as diffuse, severe, and stabbing. The pain is associated with frequent bilious emesis, and he is unable to tolerate any oral intake. The patient's last bowel movement was over 24 hours ago, and he is passing minimal flatus. He has had nausea, anorexia, and intermittent abdominal pain for the last 6 months. The patient has never required surgery. His family emigrated from Indonesia 4 weeks ago. Temperature is 37.6 C (99.7 F), blood pressure is 112/78 mm Hg, pulse is 110/min, and respirations are 12/min. Mucous membranes are pale and dry. Heart and lung sounds are unremarkable aside from tachycardia. The abdomen is diffusely tender and distended without rebound or involuntary guarding. Bowel sounds are high-pitched and loud. Laboratory results are as follows:

Complete blood count	
Hemoglobin	10.5 g/dL
Platelets	455,000/mm ³
Leukocytes	13,800/mm ³
Neutrophils	60%
Lymphocytes	20%
Eosinophils	15%

Serum chemistry	
Sodium	142 mEq/L
Potassium	3.3 mEq/L
Creatinine	1.2 mg/dL

An abdominal x-ray shows small bowel dilation and air-fluid levels without pneumobilia. Which of the following is the most likely etiology of this patient's presentation?

	Leukocytes	13,800/mm ³
	Neutrophils	60%
	Lymphocytes	20%
	Eosinophils	15%
	Serum chemistry	
	Sodium	142 mEq/L
	Potassium	3.3 mEq/L
	Creatinine	1.2 mg/dL

An abdominal x-ray shows small bowel dilation and air-fluid levels without pneumobilia. Which of the following is the most likely etiology of this patient's presentation?

- ☐ A. Ascariasis
- ☐ B. Gallstone ileus
- ☐ C. Peritoneal adhesions
- ☐ D. Small bowel lymphoma
- ☐ E. Ulcerative colitis

Submit

Leukocytes 13,800/mm³
Neutrophils 60%
Lymphocytes 20%
Eosinophils 15%

Serum chemistry

Sodium 142 mEq/L
Potassium 3.3 mEq/L
Creatinine 1.2 mg/dL

An abdominal x-ray shows small bowel dilation and air-fluid levels without pneumobilia. Which of the following is the most likely etiology of this patient's presentation?

- ☒ A. Ascariasis (78%)
- ☐ B. Gallstone ileus (8%)
- ☐ C. Peritoneal adhesions (2%)
- ☐ D. Small bowel lymphoma (7%)
- ☐ E. Ulcerative colitis (2%)

Omitted

Correct answer

78% Answered correctly

05 secs Time Spent

04/27/2020 Last Updated

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Explanation

This patient with abdominal pain and distension, high-pitched bowel sounds, obstipation, and imaging demonstrating small bowel dilation with air-fluid levels has a **small bowel obstruction** (SBO). In a patient with peripheral eosinophilia and recent emigration from an endemic region (eg, **Asia**, Africa, South America), this presentation is concerning for **ascariasis**. *Ascaris lumbricoides* is a parasitic roundworm spread via fecal-oral transmission. Ingested eggs hatch in the colon, and larvae penetrate the colonic wall to spread hematogenously to the lungs, where they are coughed up, swallowed, and mature into egg-laying adult worms in the small intestine.

Most patients are asymptomatic, with symptoms generally occurring only in those with a high worm burden. Pulmonary manifestations (eg, cough, eosinophilic pneumonitis) are rare but can occur within the first few weeks of an infection. Intestinal manifestations, which are more common, occur 1-2 months later and are usually nonspecific (eg, **abdominal pain**, nausea/vomiting, anorexia, diarrhea). However, adult worms can **obstruct the lumen of the small bowel** or hepatobiliary tree, resulting in SBO, biliary colic, cholangitis, or acute pancreatitis. Laboratory findings include **peripheral eosinophilia** (often the first sign of ascariasis) and signs of malnutrition (eg, vitamin deficiency, anemia).

The diagnosis is confirmed with visualization of *Ascaris* eggs or macroscopic worms in the stool or respiratory secretions. Management of an ascariasis SBO is usually conservative and includes nasogastric suction and fluid/electrolyte repletion, followed by definitive treatment with **albendazole** or **mebendazole**.

(Choice B) Gallstone ileus results from gallstone passage through a biliary-enteric fistula, leading to a mechanical SBO. However, pneumobilia is usually visualized on plain radiography and eosinophilia is unexpected. In addition, it occurs more commonly in elderly patients.

(Choice C) Peritoneal adhesions can cause SBO; however, they would be unexpected in a patient without prior intraabdominal surgeries. Eosinophilia would not occur.

(Choice D) Small bowel lymphoma can cause abdominal pain, malabsorption, and SBO. However, it is very rare and usually associated with unintentional weight loss. Peripheral eosinophilia is unexpected.

(Choice E) Ulcerative colitis can cause abdominal pain and malnutrition but usually also causes hematochezia. Unlike Crohn disease, ulcerative colitis does not involve the small bowel and would not cause SBO.

Educational objective:

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(Choice E) Ulcerative colitis can cause abdominal pain and malnutrition but usually also causes hematochezia. Unlike Crohn disease, ulcerative colitis does not involve the small bowel and would not cause SBO.

Educational objective:

Ascariasis typically affects patients with recent travel from endemic regions (eg, Asia, Africa, South America). It is often asymptomatic but may cause pulmonary (eg, cough, eosinophilic pneumonitis) or intestinal (eg, abdominal pain, nausea/vomiting, malnutrition) manifestations. Complications include obstruction of the small bowel or hepatobiliary tree (eg, cholangitis, pancreatitis). Treatment includes albendazole or mebendazole.

References

- [Soil-transmitted helminth infections](#)
- [Global numbers of infection and disease burden of soil transmitted helminth infections in 2010](#)

Surgery

Gastrointestinal & Nutrition

Ascariasis

Subject

System

Topic

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TUTOR

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Question Id: 16496



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Settings

A 65-year-old man comes to the office due to tingling, numbness, and burning pain in his left hand for several weeks. He also has similar symptoms in his right hand but to a lesser extent. The patient has end-stage renal disease due to hypertension and, for the past 2 years, has been receiving hemodialysis through an arteriovenous fistula of the left arm. Symptoms worsen during hemodialysis sessions. The patient has no symptoms in the legs. He has no muscle weakness, headache, vision changes, speech changes, or swallowing difficulty. Which of the following is the most likely diagnosis?

- ☐ A. Carpal tunnel syndrome
- ☐ B. Cervical myelopathy
- ☐ C. Subclavian steal syndrome
- ☐ D. Transient hypocalcemia
- ☐ E. Uremic polyneuropathy

Submit



TUTOR



Feedback



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A 65-year-old man comes to the office due to tingling, numbness, and burning pain in his left hand for several weeks. He also has similar symptoms in his right hand but to a lesser extent. The patient has end-stage renal disease due to hypertension and, for the past 2 years, has been receiving hemodialysis through an arteriovenous fistula of the left arm. Symptoms worsen during hemodialysis sessions. The patient has no symptoms in the legs. He has no muscle weakness, headache, vision changes, speech changes, or swallowing difficulty. Which of the following is the most likely diagnosis?

- ✓ ☒ A. Carpal tunnel syndrome (44%)
- ☐ B. Cervical myelopathy (2%)
- ☐ C. Subclavian steal syndrome (16%)
- ☐ D. Transient hypocalcemia (25%)
- ☐ E. Uremic polyneuropathy (11%)

Omitted

Correct answer
A



44%
Answered correctly



01 sec
Time Spent



01/27/2020
Last Updated

Explanation

This patient with **end-stage renal disease** (ESRD) has tingling, numbness, and burning of the bilateral hands that worsen during hemodialysis, suggesting **carpal tunnel syndrome** (CTS). CTS occurs due to compression of the median nerve as it passes through the **carpal tunnel** in the wrist.

CTS is the most **common mononeuropathy** in patients on **hemodialysis**, with up to a third reporting symptoms. The etiology in this population

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Settings

This patient with **end-stage renal disease** (ESRD) has tingling, numbness, and burning of the bilateral hands that worsen during hemodialysis, suggesting **carpal tunnel syndrome** (CTS). CTS occurs due to compression of the median nerve as it passes through the **carpal tunnel** in the wrist.

CTS is the most **common mononeuropathy** in patients on **hemodialysis**, with up to a third reporting symptoms. The etiology in this population is multifactorial. The most common cause is likely **dialysis-related amyloidosis**, in which inflammation stimulates the formation of beta-2 microglobulin. This is inadequately cleared and deposited as amyloid within the carpal tunnel. Other contributing factors include **increased venous pressure during hemodialysis**, blood tracking (through fascial planes) from the fistula into the carpal tunnel during vascular access, and deposition of calcium phosphate in the tunnel, all of which worsen extrinsic compression of the nerve. In addition, vascular steal through the fistula may lead to ischemic neuropathy.

Manifestations include pain and paresthesia involving the first 3 digits and the radial aspect of the fourth; however, patients may also have referred pain throughout the hand. Symptoms typically **worsen during dialysis** and are **more severe in the arm with vascular access** (eg, fistula, graft). In all forms of CTS, including that caused by dialysis-related amyloidosis, symptoms are frequently reproducible with **provocative measures**. The diagnosis is usually made clinically but can be confirmed with electrodiagnostic studies.

(Choice B) Cervical myelopathy is characterized by slowly progressive weakness, numbness, and ataxia involving the upper and lower extremities. It would not be expected to cause pain that worsens with hemodialysis.

(Choice C) Subclavian steal syndrome causes exercise-induced arm pain, paresthesia, coolness, and color change. It typically affects the entire arm, not just the hands, and bilateral symptoms would be unexpected.

(Choice D) Hypocalcemia can result in hand cramping and paresthesia but typically occurs in association with perioral numbness and tetany. It would not usually be more severe unilaterally or worsen during hemodialysis.

(Choice E) Uremic polyneuropathy is common in patients with ESRD but causes progressive pain and paresthesia in the feet, not the hands. Because it is due to uremia, the polyneuropathy typically resolves when dialysis is initiated.

Educational objective:

Carpal tunnel syndrome is the most common mononeuropathy in patients with end-stage renal disease on dialysis. It is characterized by pain and paresthesia in the lateral hand; symptoms typically worsen during dialysis and are more severe in the arm with vascular access.

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microglobulin. This is inadequately cleared and deposited as amyloid within the carpal tunnel. Other contributing factors include **increased venous pressure during hemodialysis**, blood tracking (through fascial planes) from the fistula into the carpal tunnel during vascular access, and deposition of calcium phosphate in the tunnel, all of which worsen extrinsic compression of the nerve. In addition, vascular steal through the fistula may lead to ischemic neuropathy.

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Educational objective:

Carpal tunnel syndrome is the most common mononeuropathy in patients with end-stage renal disease on dialysis. It is characterized by pain and paresthesia in the lateral hand; symptoms typically worsen during dialysis and are more severe in the arm with vascular access.

Surgery

Nervous System

Carpal tunnel syndrome

Subject

System

Topic

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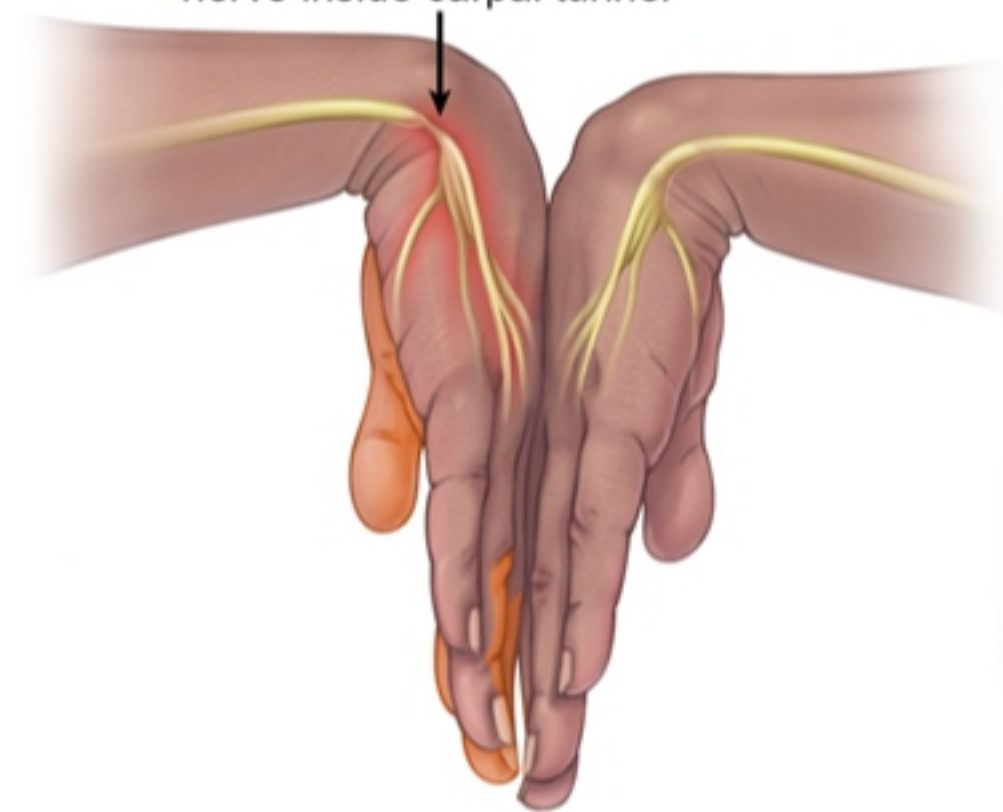
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microglobulin. This is inadequately cleared and deposited as amyloid within the carpal tunnel. Other contributing factors include **increased**

Exhibit Display

Provocative tests for carpal tunnel syndrome

Flexion of wrist compresses
nerve inside carpal tunnel



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Phalen test

Light tapping elicits
tingling sensation



Tinel sign

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Question Id: 17862



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Tutorial



Lab Values



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Settings

An 84-year-old woman with Alzheimer dementia is brought to the emergency department for evaluation after refusing to get out of bed. She has been known to wander the halls at her facility, and a nursing aide reported finding her on the floor next to her bed earlier that day. Vital signs are within normal limits. On examination, the patient is in pain. Her right leg appears shorter than her left. She is able to wiggle her toes but has significant external rotation of the right lower extremity compared with the left. There is no evidence of head trauma and the lower leg compartments are soft. Which of the following is the most likely diagnosis in this patient?

- ☐ A. Femoral neck fracture
- ☐ B. Femoral shaft fracture
- ☐ C. Posterior hip dislocation
- ☐ D. Pubic ramus fracture
- ☐ E. Trochanteric fracture

Submit



TUTOR



Feedback



Suspend



End Block

An 84-year-old woman with Alzheimer dementia is brought to the emergency department for evaluation after refusing to get out of bed. She has been known to wander the halls at her facility, and a nursing aide reported finding her on the floor next to her bed earlier that day. Vital signs are within normal limits. On examination, the patient is in pain. Her right leg appears shorter than her left. She is able to wiggle her toes but has significant external rotation of the right lower extremity compared with the left. There is no evidence of head trauma and the lower leg compartments are soft. Which of the following is the most likely diagnosis in this patient?

- ☒ A. Femoral neck fracture (61%)
- ☐ B. Femoral shaft fracture (1%)
- ☐ C. Posterior hip dislocation (31%)
- ☐ D. Pubic ramus fracture (1%)
- ☐ E. Trochanteric fracture (4%)

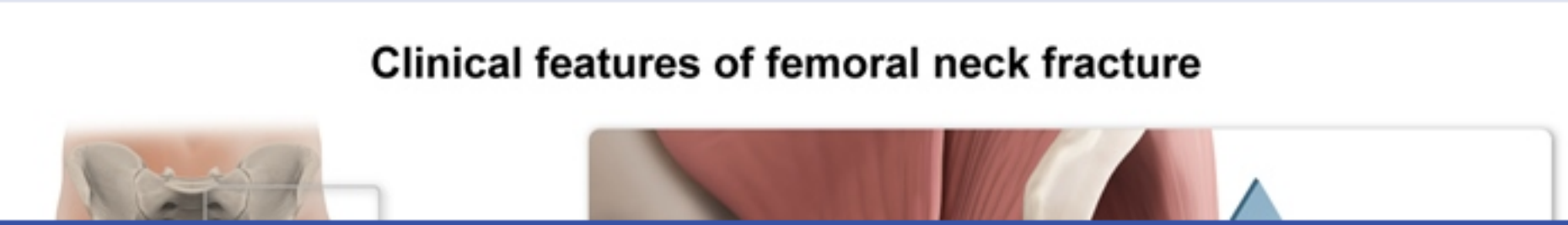
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Correct answer
A

61%
Answered correctly

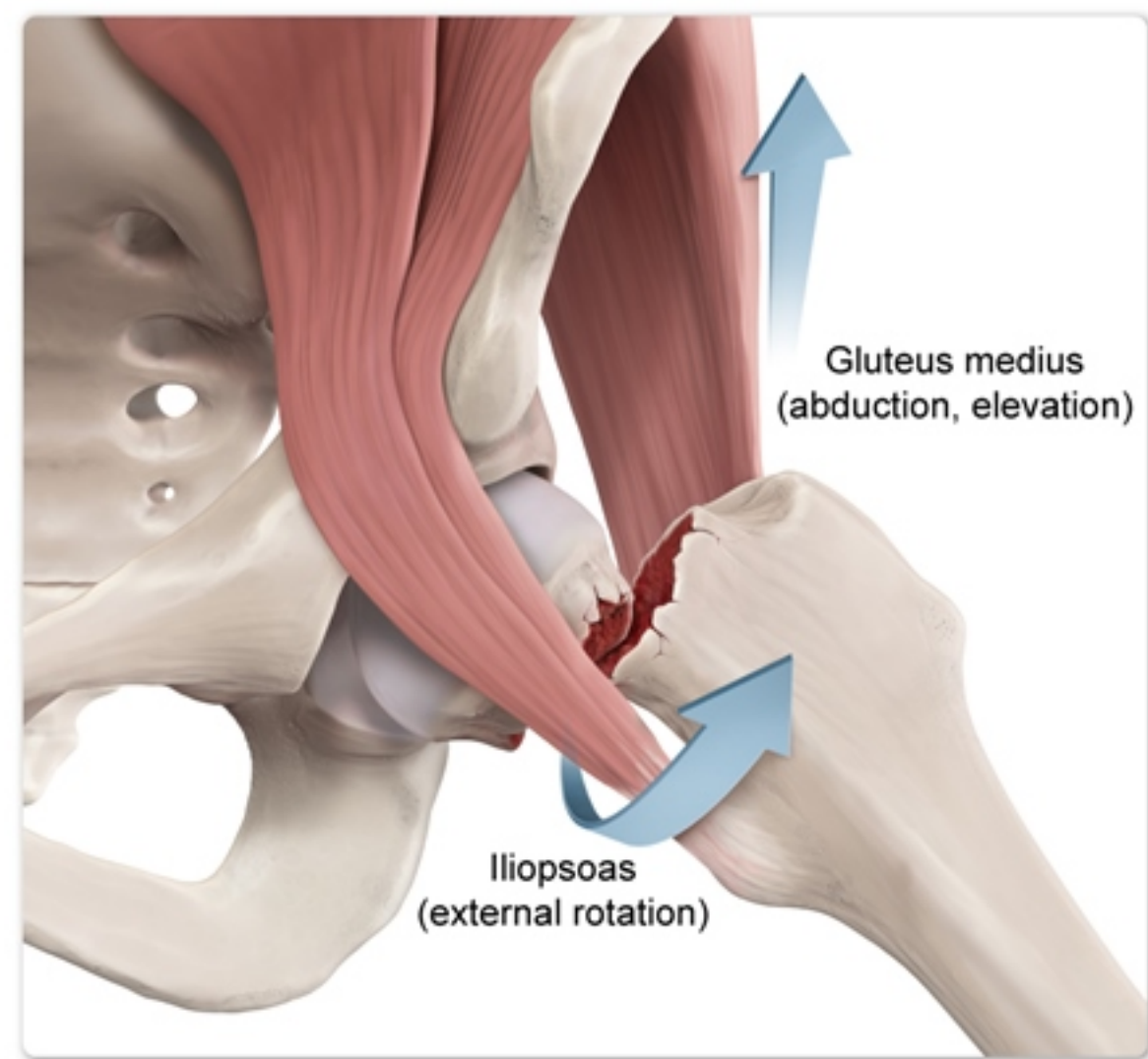
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06/04/2020
Last Updated

Explanation



Clinical features of femoral neck fracture



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This elderly woman has an acutely shortened, externally rotated leg following a fall. This presentation is most consistent with either a [femoral neck or an intertrochanteric fracture](#), which are the most common hip fractures in older adults, typically occurring due to mechanical **falls**. The classic pattern of **shortening** and **external rotation** of the leg compared with the contralateral side is primarily due to contraction of the psoas and iliacus without the normal acetabular counterforce. This pattern is also seen in anterior hip dislocation, which is significantly less common than fracture and typically occurs following severe trauma (eg, industrial accident, motor vehicle collision). An [x-ray](#) generally confirms the diagnosis of

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This elderly woman has an acutely shortened, externally rotated leg following a fall. This presentation is most consistent with either a [femoral neck or an intertrochanteric fracture](#), which are the most common hip fractures in older adults, typically occurring due to mechanical **falls**. The classic pattern of **shortening** and **external rotation** of the leg compared with the contralateral side is primarily due to contraction of the psoas and iliacus without the normal acetabular counterforce. This pattern is also seen in anterior hip dislocation, which is significantly less common than fracture and typically occurs following severe trauma (eg, industrial accident, motor vehicle collision). An [x-ray](#) generally confirms the diagnosis of fracture.

Hip fractures are classified as either intracapsular (femoral head and neck) or extracapsular (intertrochanteric or subtrochanteric). Intracapsular fractures typically present without significant ecchymoses and have a higher risk of avascular necrosis. Extracapsular fractures are at higher risk for displacement and usually have visible ecchymosis. Both types generally require [surgical correction](#) (eg, open reduction with internal fixation). In stable patients, surgery within 48 hours is associated with lower mortality and a lower risk of pressure ulcers and pneumonia.

(Choices B and D) Femoral shaft fracture in elderly patients can present with shortening of the leg, often with angulation. Pubic ramus fracture can occur from minor (or no) trauma in elderly patients and also can cause shortening of the ipsilateral leg. However, external rotation is more typical of femoral neck fracture.

(Choice C) [Posterior hip dislocation](#) typically presents with adduction and internal rotation at the hip. It usually occurs from an axial force on the femur (eg, dashboard injury), and some patients have neurologic manifestations due to involvement of the sciatic nerve.

(Choice E) Isolated [fracture of the greater trochanter](#) can occur due to a ground-level fall in older patients. Typical features include pain with abduction and tenderness at the trochanter. However, leg length is not affected.

Educational objective:

Femoral neck and intertrochanteric fractures are the most common hip fractures in older adults and most typically occur due to mechanical falls. Examination findings include shortening and external rotation of the leg compared with the contralateral side.

Surgery

Rheumatology/Orthopedics & Sports

Hip fracture

Subject

System

Topic

TUTOR

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Feedback

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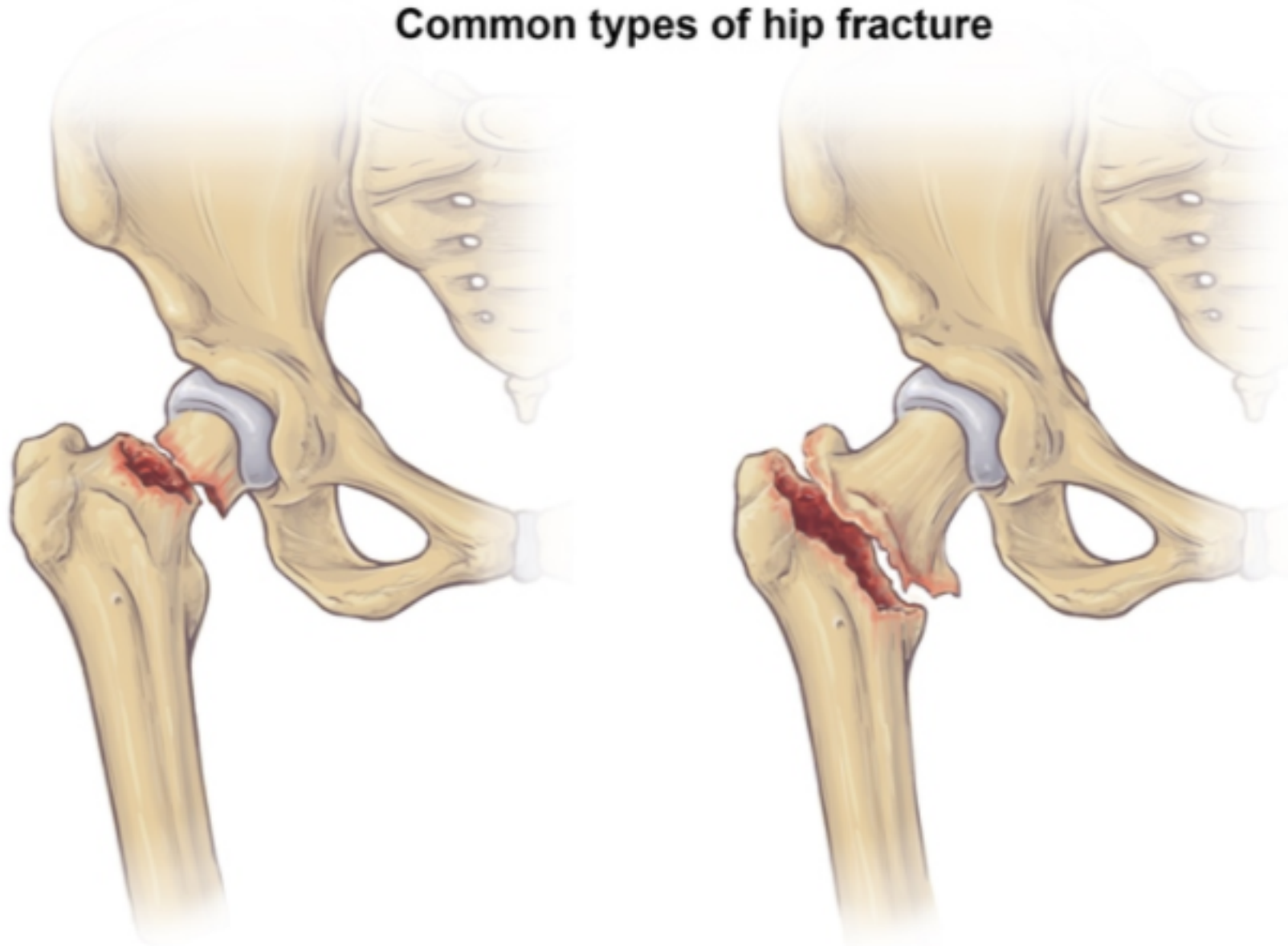
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Exhibit Display

Common types of hip fracture



Femoral neck fracture

Intertrochanteric hip fracture

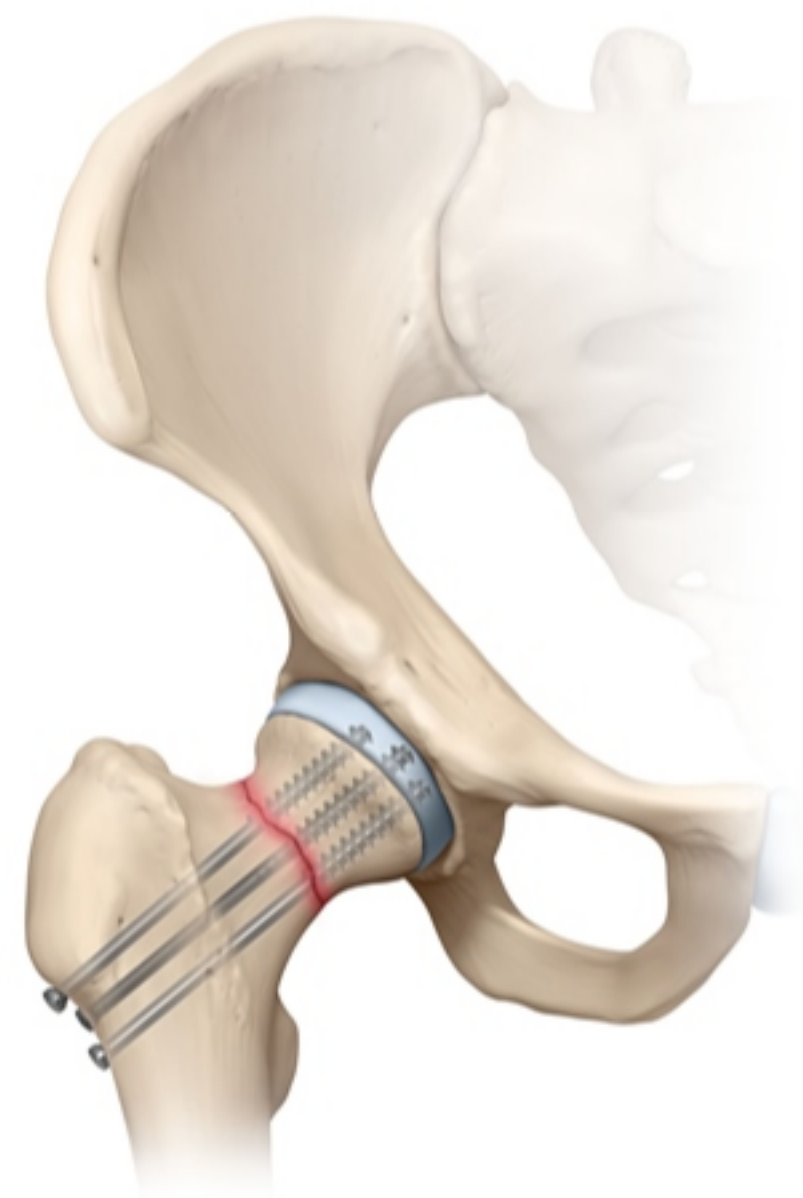
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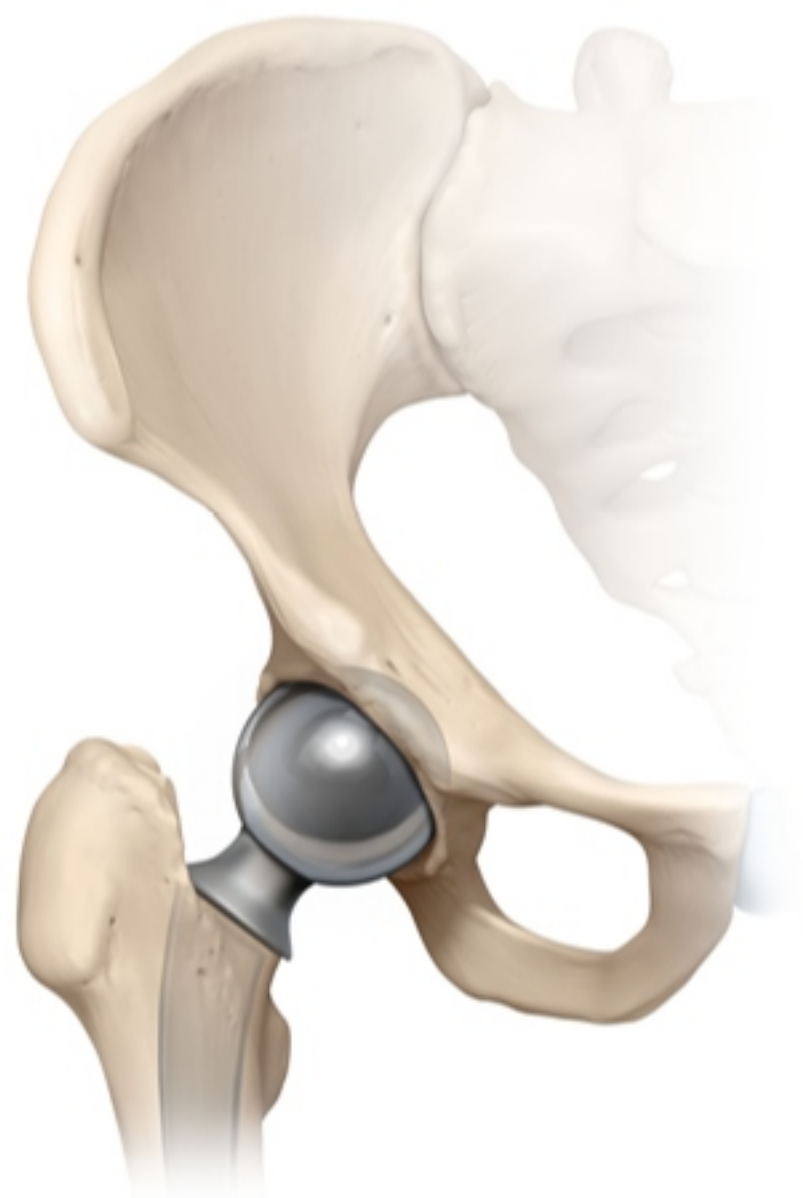
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Exhibit Display

Internal fixation



Hemiarthroplasty



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Tutorial



Lab Values



Notes



Calculator



Reverse Color



Text Zoom



Settings

A 72-year-old retired plumber comes to the office to discuss treatment of chronic right knee pain. Over the past 10 years, the patient has had multiple rounds of glucocorticoid injections and physical therapy to manage the pain, which has increasingly worsened; using a cane, he can now walk only 2 blocks before it becomes unbearable. Medical history is notable for type 2 diabetes mellitus, hypertension, and depression. Blood pressure is 130/78 mm Hg and pulse is 80/min. BMI is 26 kg/m². On examination, the right knee is stiff and swollen but has no erythema. There is tenderness on palpation at the medial and lateral joint lines, and patella grind test is positive. Ligament testing is stable to varus and valgus stress. Passive and active range of motion is limited because of pain. X-ray of the right knee shows bicompartamental joint space narrowing and multiple osteophytes. Which of the following is the best treatment option for this patient?

- ☐ A. Arthroscopic meniscectomy
- ☐ B. High-dose oral glucocorticoids
- ☐ C. Hinged knee brace application
- ☐ D. Knee joint aspiration
- ☐ E. Long-acting opioid pain medication
- ☐ F. Total knee arthroplasty

Submit



TUTOR



Feedback



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A 72-year-old retired plumber comes to the office to discuss treatment of chronic right knee pain. Over the past 10 years, the patient has had multiple rounds of glucocorticoid injections and physical therapy to manage the pain, which has increasingly worsened; using a cane, he can now walk only 2 blocks before it becomes unbearable. Medical history is notable for type 2 diabetes mellitus, hypertension, and depression. Blood pressure is 130/78 mm Hg and pulse is 80/min. BMI is 26 kg/m². On examination, the right knee is stiff and swollen but has no erythema. There is tenderness on palpation at the medial and lateral joint lines, and patella grind test is positive. Ligament testing is stable to varus and valgus stress. Passive and active range of motion is limited because of pain. X-ray of the right knee shows bicompartamental joint space narrowing and multiple osteophytes. Which of the following is the best treatment option for this patient?

- ☐ A. Arthroscopic meniscectomy (3%)
- ☐ B. High-dose oral glucocorticoids (1%)
- ☐ C. Hinged knee brace application (3%)
- ☐ D. Knee joint aspiration (1%)
- ☐ E. Long-acting opioid pain medication (2%)
- ☒ F. Total knee arthroplasty (87%)

Omitted

Correct answer
F

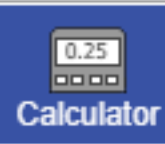
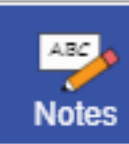
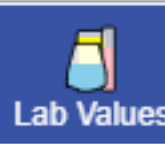
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01/16/2020
Last Updated

Explanation

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Explanation

Management of osteoarthritis

Nonpharmacologic treatment
(eg, exercise, weight loss)

↓ Symptoms persist

Topical or oral NSAIDs as needed
(consider: duloxetine, tramadol, topical capsaicin)

↓ Symptoms persist/
significant impairment

- Surgery (if possible)
- Chronic pain management (nonsurgical candidates)

NSAIDs = nonsteroidal anti-inflammatory drugs.
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This patient has chronic joint pain and stiffness consistent with **osteoarthritis** (OA). The x-ray shows typical findings, including narrowing of the joint space and periarticular osteophyte formation. Initial management of OA of the knee includes **nonpharmacologic** and lifestyle measures, including **weight loss**, regular moderate **activity** (eg, walking), and exercises to strengthen the quadriceps muscle. Simple analgesics (eg, **nonsteroidal antiinflammatory drugs**) may also be helpful.

If conservative management is inadequate, **injectable glucocorticoids** or possibly hyaluronic acid may relieve symptoms. However, appropriate measures have failed in this patient, so he is a candidate for surgical intervention with **total knee arthroplasty**, an elective surgery consisting of replacement of the articular surface of the knee with prosthetic components. Total knee arthroplasty has been associated with significant



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This patient has chronic joint pain and stiffness consistent with **osteoarthritis** (OA). The x-ray shows typical findings, including narrowing of the joint space and periarticular osteophyte formation. Initial management of OA of the knee includes **nonpharmacologic** and lifestyle measures, including **weight loss**, regular moderate **activity** (eg, walking), and exercises to strengthen the quadriceps muscle. Simple analgesics (eg, **nonsteroidal antiinflammatory drugs**) may also be helpful.

If conservative management is inadequate, **injectable glucocorticoids** or possibly hyaluronic acid may relieve symptoms. However, appropriate measures have failed in this patient, so he is a candidate for surgical intervention with **total knee arthroplasty**, an elective surgery consisting of replacement of the articular surface of the knee with prosthetic components. Total knee arthroplasty has been associated with significant improvements in pain level, function, and quality of life.

(Choice A) Arthroscopic meniscectomy is indicated for symptomatic tears of the meniscus. Long-term complications include increased risk of OA in the operated knee. In general, arthroscopic intervention is not helpful in patients with established OA.

(Choice B) Systemic glucocorticoids (eg, methylprednisolone) are occasionally considered for mild to moderate OA of the knee, but their side effect profile makes them an unattractive option. They are relatively contraindicated in this patient with comorbid diabetes, due to possible hyperglycemia.

(Choice C) Hinged unloader (valgus) knee braces transfer load from the medial to the lateral joint compartment and are useful for patients with medial unicompartmental OA associated with varus deformity. This patient has more generalized OA and would be unlikely to benefit from the use of a brace.

(Choice D) Therapeutic arthrocentesis is usually used for inflammatory or rapid-onset effusions (eg, septic arthritis, hemarthrosis). It is rarely helpful in the small effusions of OA.

(Choice E) Chronic treatment of OA with long-acting opioids does not appear to provide substantial improvements in pain or function; it also carries significant risk.

Educational objective:

Management of osteoarthritis of the knee should include weight loss, regular activity, and exercises to strengthen the quadriceps muscle. Simple analgesics may also be helpful. If conservative management is inadequate, injectable glucocorticoids may relieve symptoms. Total knee

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improvements in pain level, function, and quality of life.

(Choice A) Arthroscopic meniscectomy is indicated for symptomatic tears of the meniscus. Long-term complications include increased risk of OA in the operated knee. In general, arthroscopic intervention is not helpful in patients with established OA.

(Choice B) Systemic glucocorticoids (eg, methylprednisolone) are occasionally considered for mild to moderate OA of the knee, but their side effect profile makes them an unattractive option. They are relatively contraindicated in this patient with comorbid diabetes, due to possible hyperglycemia.

(Choice C) Hinged unloader (valgus) knee braces transfer load from the medial to the lateral joint compartment and are useful for patients with medial unicompartmental OA associated with varus deformity. This patient has more generalized OA and would be unlikely to benefit from the use of a brace.

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(Choice E) Chronic treatment of OA with long-acting opioids does not appear to provide substantial improvements in pain or function; it also carries significant risk.

Educational objective:

Management of osteoarthritis of the knee should include weight loss, regular activity, and exercises to strengthen the quadriceps muscle. Simple analgesics may also be helpful. If conservative management is inadequate, injectable glucocorticoids may relieve symptoms. Total knee arthroplasty is indicated for those who fail less aggressive measures.

References

- Total joint arthroplasty for persons with osteoarthritis.

Surgery

Rheumatology/Orthopedics & Sports

Osteoarthritis

Subject

System

Topic

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Exhibit Display



(Choice D) Therapeutic arthrocentesis is usually used for inflammatory or rapid-onset effusions (eg, septic arthritis, hemarthrosis). It is rarely

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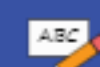
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Tutorial



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Settings

A 34-year-old man is brought to the emergency department after a snowmobile accident. The patient was thrown 3 m (9.8 feet) and was dazed for several minutes afterward, although he was wearing a helmet and did not lose consciousness. He now has left mid-back pain. Blood pressure is 130/76 mm Hg and pulse is 98/min. Breath sounds are clear and symmetric. Heart sounds are normal. The abdomen is soft and nontender. There are no areas of spinal tenderness or step-offs. The left costovertebral area is tender to palpation. Focused Assessment with Sonography for Trauma reveals no pericardial or intraperitoneal free fluid, and chest and pelvic x-rays are normal. The patient provides a clear urine sample without pain or difficulty. Urinalysis shows 11-25 erythrocytes/hpf. Complete blood count, serum electrolytes, and creatinine are within normal limits. Which of the following is the best next step in management of this patient?

- ☐ A. CT scan of the abdomen and pelvis
- ☐ B. Reassurance and analgesics
- ☐ C. Retrograde cystourethrogram
- ☐ D. Selective renal angiography
- ☐ E. Urinary catheter insertion

Submit



TUTOR



Feedback



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End Block

A 34-year-old man is brought to the emergency department after a snowmobile accident. The patient was thrown 3 m (9.8 feet) and was dazed for several minutes afterward, although he was wearing a helmet and did not lose consciousness. He now has left mid-back pain. Blood pressure is 130/76 mm Hg and pulse is 98/min. Breath sounds are clear and symmetric. Heart sounds are normal. The abdomen is soft and nontender. There are no areas of spinal tenderness or step-offs. The left costovertebral area is tender to palpation. Focused Assessment with Sonography for Trauma reveals no pericardial or intraperitoneal free fluid, and chest and pelvic x-rays are normal. The patient provides a clear urine sample without pain or difficulty. Urinalysis shows 11-25 erythrocytes/hpf. Complete blood count, serum electrolytes, and creatinine are within normal limits. Which of the following is the best next step in management of this patient?

- ☒ A. CT scan of the abdomen and pelvis (62%)
- ☐ B. Reassurance and analgesics (12%)
- ☐ C. Retrograde cystourethrogram (18%)
- ☐ D. Selective renal angiography (4%)
- ☐ E. Urinary catheter insertion (1%)

Omitted

Correct answer
A

62% Answered correctly

02 secs Time Spent

04/18/2020 Last Updated

Explanation

This patient with **blunt trauma** (eg, snowmobile accident) now has left mid-back pain, costovertebral area (CVA) tenderness, and microscopic hematuria (ie, >3 erythrocytes/hpf on urinalysis). This presentation is concerning for **renal injury** and should prompt imaging of the kidneys via CT scan.

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Settings

This patient with **blunt trauma** (eg, snowmobile accident) now has left mid-back pain, costovertebral area (CVA) tenderness, and microscopic hematuria (ie, >3 erythrocytes/hpf on urinalysis). This presentation is concerning for **renal injury** and should prompt imaging of the kidneys via CT scan.

The kidneys are the most commonly injured organ of the genitourinary system, typically from blunt trauma (eg, direct blow, compression against paravertebral muscles). Clinical findings vary depending on the degree of injury. Renal contusion, as is likely in this patient, can cause **flank** (ie, left mid-back) **pain**, **CVA tenderness**, and/or **hematuria** (gross or microscopic). More severe injuries, such as renal laceration or renal vessel injury, can result in retroperitoneal bleeding with flank ecchymosis and/or hemodynamic instability.

CT scan of the abdomen and pelvis with contrast (typically multiphase: noncontrast, arterial, corticomedullary, excretory) is used to diagnose renal trauma and should be obtained in patients with **concerning clinical findings** (eg, CVA tenderness) or **mechanisms of injury**. Hematuria is an additional indication; however, the absence of hematuria does not exclude the need for CT scan because hematuria is absent in up to one-third of renal injuries, including severe injuries.

(Choice B) This patient has indications (eg, concerning clinical findings, hematuria) for further imaging to rule out renal injury. Reassurance and analgesics are only appropriate once renal injury has been excluded.

(Choices C and E) Retrograde cystourethrogram is used to evaluate for bladder or urethral injuries, which can cause hematuria. However, these injuries typically cause gross, rather than microscopic, hematuria and are accompanied by difficulty urinating, suprapubic pain (bladder injury), or blood at the urethral meatus (urethral injury). Given this patient's mid-back pain and CVA tenderness, renal injury is the more likely cause of hematuria, and a CT scan should be performed first. If the CT scan is negative, retrograde cystourethrogram may be indicated, especially prior to urinary catheter insertion because catheterization can worsen urethral injuries.

(Choice D) Selective renal angiography and embolization may be used to evaluate and treat some renal injuries with active bleeding. However, this procedure is typically only undertaken after visualizing the extent of renal injury via CT scan.

Educational objective:

Blunt trauma can cause renal injury. Concerning clinical findings include flank pain and ecchymosis, costovertebral area tenderness, and hematuria. These findings, or a concerning mechanism of injury, should prompt CT scan of the abdomen and pelvis.

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injury, can result in retroperitoneal bleeding with flank ecchymosis and/or hemodynamic instability.

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Educational objective:

Blunt trauma can cause renal injury. Concerning clinical findings include flank pain and ecchymosis, costovertebral area tenderness, and hematuria. These findings, or a concerning mechanism of injury, should prompt CT scan of the abdomen and pelvis.

References

- Renal trauma: the current best practice.

Surgery

Renal, Urinary Systems & Electrolytes

Renal trauma

Subject

System

Topic

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Question Id: 16209



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Tutorial



Lab Values



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Settings

A 72-year-old woman comes to the office due to intermittent lower abdominal discomfort for the past several months. The patient also reports frequent urges for bowel movements every day producing small-volume stools or just mucus and are often followed by a sensation of incomplete evacuation. Physical examination shows a nondistended and nontender abdomen. Digital rectal examination reveals normal rectal tone and an empty rectal vault. When the patient is instructed to bear down, an erythematous mass with concentric rings protrudes through the anus and spontaneously retracts. Which of the following is the strongest risk factor for this patient's current condition?

- ☐ A. Colonic polyps
- ☐ B. Crohn disease
- ☐ C. Human papillomavirus infection
- ☐ D. Multiple childbirths
- ☐ E. Portal hypertension

Submit



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A 72-year-old woman comes to the office due to intermittent lower abdominal discomfort for the past several months. The patient also reports frequent urges for bowel movements every day producing small-volume stools or just mucus and are often followed by a sensation of incomplete evacuation. Physical examination shows a nondistended and nontender abdomen. Digital rectal examination reveals normal rectal tone and an empty rectal vault. When the patient is instructed to bear down, an erythematous mass with concentric rings protrudes through the anus and spontaneously retracts. Which of the following is the strongest risk factor for this patient's current condition?

- ☐ A. Colonic polyps (6%)
- ☐ B. Crohn disease (7%)
- ☐ C. Human papillomavirus infection (3%)
- ☒ D. Multiple childbirths (70%)
- ☐ E. Portal hypertension (11%)

Omitted

Correct answer
D

 70%
Answered correctly

 02 secs
Time Spent

 02/09/2020
Last Updated

Explanation

Clinical features of rectal prolapse	
	• Women age >40 with history of vaginal deliveries/multiparity • Prior pelvic surgery

Clinical features of rectal prolapse	
Risk factors	• Women age >40 with history of vaginal deliveries/multiparity • Prior pelvic surgery • Chronic constipation, diarrhea, or straining • Stroke, dementia • Pelvic floor dysfunction or anatomic defects
Clinical presentation	• Abdominal discomfort (not significant pain) • Straining or incomplete bowel evacuation, fecal incontinence with mucus • Digital maneuvers possibly required for defecation • Erythematous mass extending through anus with concentric rings of rectum (can be intermittent)
Management	• Medical ◦ Considered for non–full-thickness prolapse ◦ Adequate fiber & fluid intake, pelvic floor muscle exercises ◦ Possible biofeedback for fecal incontinence • Surgical ◦ Preferred for full-thickness or symptomatic prolapse (eg, fecal incontinence, constipation, sensation of mass)

This older woman has intermittent rectal protrusion of an erythematous mass, suggesting **rectal prolapse**. In rectal prolapse, a mucosal or full-thickness layer of rectal tissue slides through the anal orifice. It is most common in **women age >40**. Risk factors include **multiparity**, vaginal delivery, pelvic surgery, pelvic floor dysfunction, chronic constipation or straining, dementia, and stroke.

Rectal prolapse usually presents with stool incontinence or constipation; a palpable mass is often present during defecation and may require manual reduction. Rectal irritation can produce a **mucous discharge** that may be tinged with blood. Although **abdominal discomfort** can occur, significant pain is not typical and suggests another diagnosis. Physical examination often demonstrates a patulous anus, and maneuvers that increase intraabdominal pressure (eg, Valsalva) can induce prolapse, revealing a painless, **erythematous mass with concentric rings** extending through the anus. The diagnosis is made clinically, and management includes increased fiber intake, pelvic floor muscle exercises, and, possibly,

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• Preferred for full-thickness or symptomatic prolapse (eg, fecal incontinence, constipation, sensation or mass)

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(Choice A) Colonic polyps can rarely cause rectal prolapse; however, the examination would likely demonstrate a prolapsed polyp (pedunculated mass) in addition to the rectum. Colonic polyps are more commonly associated with increased risk of colonic malignancy.

(Choice B) Crohn disease is associated with increased risk of perianal disease (eg, fissure, abscess, fistula), not rectal prolapse.

(Choice C) Human papillomavirus can lead to anogenital warts (cauliflower-shaped, fungating, skin-colored lesions) and squamous cell carcinoma of the anus (ulcerating lesion often associated with bleeding), not rectal prolapse.

(Choice E) Portal hypertension increases the risk of hemorrhoids. Although internal hemorrhoids can occasionally prolapse, examination demonstrates bulging, purplish veins, not a ringed mass. In addition, hemorrhoids typically result in bleeding during defecation, not abdominal discomfort or passage of mucus.

Educational objective:

Rectal prolapse is characterized by intermittent protrusion of the rectum (ie, erythematous mass with concentric rings) through the anal orifice. It is often associated with fecal incontinence, constipation, and/or mucous discharge. Rectal prolapse is most common in women age >40. Risk factors include multiparity, vaginal delivery, pelvic surgery, pelvic floor dysfunction, chronic constipation or straining, dementia, and stroke.

Surgery

Gastrointestinal & Nutrition

Rectal prolapse

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Surgery

Gastrointestinal & Nutrition

Rectal prolapse

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A 55-year-old woman is brought to the emergency department due to worsening headaches and right-sided weakness. The patient developed these headaches a month ago and since then has had continuous throbbing pain over the left side of her head that is associated with nausea. More recently, she has noticed increasing difficulty using her right arm and leg. The patient has had no trauma, neck stiffness, fever, double or blurry vision, or photophobia. She recently emigrated from Mexico with her family. She is a retired seamstress and admits to chronic tobacco use for many years. Her temperature is 36.7 C (98 F), blood pressure is 150/90 mm Hg, pulse is 84/min, and respirations are 14/min. Neurologic examination is significant for right-sided pronator drift. A non-contrast head CT scan reveals a partially calcified round extra-axial mass compressing the left frontal lobe, as shown in this [exhibit](#). The mass appears dural-based and homogeneously enhances on post-gadolinium MRI. Which of the following is the most appropriate next course of action in management of this patient?

- ☐ A. Chemotherapy
- ☐ B. Combination antitubercular therapy
- ☐ C. CT scan of the chest, abdomen, and pelvis
- ☐ D. Surgical resection
- ☐ E. Whole brain radiation

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Exhibit Display



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- ☐ A. Chemotherapy (2%)
- ☐ B. Combination antitubercular therapy (5%)
- ☐ C. CT scan of the chest, abdomen, and pelvis (26%)
- ☒ D. Surgical resection (65%)
- ☐ E. Whole brain radiation (0%)

Omitted
Correct answer
D

65%
Answered correctly

03 mins, 19 secs
Time Spent

04/30/2020
Last Updated

Explanation

This patient's presenting symptoms and imaging findings are consistent with an expanding intracranial neoplasm. The presence of an **extra-axial**

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This patient's presenting symptoms and imaging findings are consistent with an expanding intracranial neoplasm. The presence of an **extra-axial well-circumscribed** or round homogenously enhancing **dural-based** mass on **MRI** is strongly suggestive of a **meningioma**. These tumors usually undergo **calcification** and can appear hyperdense on non-contrast head CT scan (red arrow).

Meningiomas are considered to be **benign** primary brain tumors arising from meningotheial cells and are more commonly found in middle-age to elderly women. They can cause significant neurologic symptoms (eg, headache, seizure, focal weakness/numbness) if they become large enough to cause mass effect on critical neurovascular structures. The diagnosis of meningioma is confirmed intraoperatively and the treatment of choice in symptomatic patients is typically **complete resection** as this leads to a cure in most individuals.

(Choice A) Chemotherapy is not considered first-line treatment for meningioma. Chemotherapy may be coupled with surgical resection and radiation in patients with highly malignant primary brain tumors (eg, glioblastoma multiforme, medulloblastoma). It can also be considered in patients with highly chemosensitive metastatic brain disease (eg, due to testicular germ cell tumor).

(Choice B) Isoniazid, rifampin, pyrazinamide, and ethambutol may be used to treat tuberculosis, which can cause meningitis and rarely intracerebral tuberculoma in patients from endemic areas (eg, Mexico and other developing countries). Tuberculosis is less likely in this patient given the absence of systemic symptoms (eg, fever, weight loss, night sweats) or chronic cough.

(Choice C) CT scan of the chest, abdomen, and pelvis is usually done to look for a primary visceral malignancy in patients suspected of having metastatic brain disease. Brain metastasis, which is more common than primary brain tumor, typically appears as multiple ring-enhancing lesions at the grey-white junction (intra-axial).

(Choice E) Whole brain radiation is not indicated for the treatment of meningioma; rather, it is usually considered for the treatment of diffuse metastatic brain disease. Focused tumor radiation (stereotactic radiosurgery) may be considered for partially resected or unresectable meningiomas.

Educational objective:

The presence of an extra-axial well-circumscribed dural-based mass that is partially calcified on neuroimaging is strongly suggestive of a meningioma. Meningiomas are considered benign primary brain tumors; however, they can present with headache, seizure, and focal neurologic deficits due to mass effect. In such cases, complete surgical resection is recommended.

References

TUTOR

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Feedback

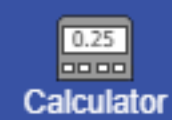
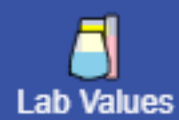
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Question Id: 4544



A 73-year-old man is seen in the hospital due to severe left facial pain and inability to fully open his mouth. These symptoms began earlier today. Eight days ago, the patient underwent a laparotomy for intestinal obstruction. The procedure went well, and he has had several bowel movements since the operation. Medical history is significant for dementia and colon cancer, which was diagnosed 5 years ago and is currently in remission. The patient resides in a nursing home. Temperature is 38.9 C (102 F), blood pressure is 150/80 mm Hg, pulse is 90/min, and respirations are 16/min. Examination shows swelling, erythema, and severe tenderness in the left preauricular area. Laboratory studies reveal a white blood cell count of 15,600/mm³. Which of the following would most likely have prevented this complication?

- ☐ A. Adequate fluid intake and oral hygiene
- ☐ B. Administration of polysaccharide vaccine
- ☐ C. Administration of tetanus toxoid
- ☐ D. Avoidance of extreme jaw opening during intubation
- ☐ E. Avoidance of volatile anesthetic agents during surgery
- ☐ F. Encouragement of incentive spirometry
- ☐ G. Initiation of early ambulation

Submit



A 73-year-old man is seen in the hospital due to severe left facial pain and inability to fully open his mouth. These symptoms began earlier today. Eight days ago, the patient underwent a laparotomy for intestinal obstruction. The procedure went well, and he has had several bowel movements since the operation. Medical history is significant for dementia and colon cancer, which was diagnosed 5 years ago and is currently in remission. The patient resides in a nursing home. Temperature is 38.9 C (102 F), blood pressure is 150/80 mm Hg, pulse is 90/min, and respirations are 16/min. Examination shows swelling, erythema, and severe tenderness in the left preauricular area. Laboratory studies reveal a white blood cell count of 15,600/mm³. Which of the following would most likely have prevented this complication?

- ☒ A. Adequate fluid intake and oral hygiene (53%)
- ☐ B. Administration of polysaccharide vaccine (10%)
- ☐ C. Administration of tetanus toxoid (7%)
- ☐ D. Avoidance of extreme jaw opening during intubation (21%)
- ☐ E. Avoidance of volatile anesthetic agents during surgery (3%)
- ☐ F. Encouragement of incentive spirometry (1%)
- ☐ G. Initiation of early ambulation (2%)

Omitted

Correct answer
A

53%
Answered correctly

01 sec
Time Spent

04/21/2020
Last Updated

Explanation

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Suppurative parotitis	
Risk factors	- Elderly, dehydrated, postsurgical - Decreased oral intake (eg, NPO perioperatively) - Medications (eg, anticholinergics) - Obstruction (eg, calculi, neoplasm)
Clinical presentation	- Firm, erythematous pre/postauricular swelling - Exquisite tenderness exacerbated by chewing and palpation - Trismus, systemic findings (eg, fever, chills) - Elevated serum amylase without pancreatitis
Management	- Ultrasound or CT scan (eg, ductal obstruction, abscess) - Hydration, oral hygiene - Antibiotics - Massage (ie, milking pus out of gland) - Sialagogues

This elderly patient with fever, leukocytosis, and severe tenderness and swelling of the left parotid gland following a recent surgical procedure likely has acute **suppurative parotitis**. Suppurative parotitis often occurs in **elderly postoperative** patients, particularly those with dementia who are at risk of inadequate **fluid hydration** and poor **oral hygiene**. In these patients, **salivary stasis** (due to NPO status, poor oral hygiene, and dehydration) leads to retrograde seeding of bacteria from the oral cavity (eg, *Staphylococcus aureus*, oral flora) through Stenson's duct to the parotid gland. Patients then have rapid-onset and excruciatingly **painful** swelling of the involved **parotid gland** that is aggravated by chewing. Examination shows an exquisitely tender, swollen, and erythematous gland. Purulent fluid can often be expressed from the parotid duct.

Although the diagnosis is typically evident after clinical evaluation, imaging (CT scan or ultrasound) should be obtained to assess for salivary stones or neoplasms obstructing the duct, as well as to differentiate between suppurative parotitis and an abscess. Treatment includes intravenous, broad-spectrum antibiotics (narrowed based on culture results), hydration, sialagogues (increase salivary flow), and massage

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This elderly patient with fever, leukocytosis, and severe tenderness and swelling of the left parotid gland following a recent surgical procedure likely has acute **suppurative parotitis**. Suppurative parotitis often occurs in **elderly postoperative** patients, particularly those with dementia who are at risk of inadequate **fluid hydration** and poor **oral hygiene**. In these patients, **salivary stasis** (due to NPO status, poor oral hygiene, and dehydration) leads to retrograde seeding of bacteria from the oral cavity (eg, *Staphylococcus aureus*, oral flora) through Stenson's duct to the parotid gland. Patients then have rapid-onset and excruciatingly **painful** swelling of the involved **parotid gland** that is aggravated by chewing. Examination shows an exquisitely tender, swollen, and erythematous gland. Purulent fluid can often be expressed from the parotid duct.

Although the diagnosis is typically evident after clinical evaluation, imaging (CT scan or ultrasound) should be obtained to assess for salivary stones or neoplasms obstructing the duct, as well as to differentiate between suppurative parotitis and an abscess. Treatment includes intravenous, broad-spectrum antibiotics (narrowed based on culture results), hydration, sialagogues (increase salivary flow), and massage (expression of purulence from the duct).

(Choice B) Polysaccharide vaccine is given to patients age ≥ 65 to prevent illnesses caused by *Streptococcus pneumoniae*. However, *S aureus* and oral flora are much more commonly implicated in suppurative parotitis.

(Choice C) Tetanus can present with painful trismus (due to masseter spasm) and sometimes fever. However, unilateral erythema and swelling of the parotid gland would not occur, and other muscle spasms (eg, clenched fists, stiff neck, rigid abdomen) are typically present.

(Choice D) Extreme jaw opening (eg, during intubation) can cause anterior temporomandibular joint dislocation, which presents with pain in the preauricular area and difficulty opening or closing the jaw. However, fever with leukocytosis would not be present.

(Choice E) Malignant hyperthermia occurs in susceptible patients following administration of volatile anesthetic agents and can present with hyperthermia and masseter muscle spasms. However, it typically presents within an hour of anesthesia induction; is not associated with leukocytosis; and would not have localized symptoms.

(Choices F and G) Incentive spirometry and early ambulation can reduce postoperative pulmonary complications (eg, pneumonia), but neither prevent parotitis.

Educational objective:

Suppurative parotitis presents with exquisitely painful swelling of the parotid gland. This postoperative complication can be prevented with adequate fluid hydration and oral hygiene.

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intravenous, broad-spectrum antibiotics (narrowed based on culture results), hydration, sialagogues (increase salivary flow), and massage (expression of purulence from the duct).

(Choice B) Polysaccharide vaccine is given to patients age ≥ 65 to prevent illnesses caused by *Streptococcus pneumoniae*. However, *S aureus* and oral flora are much more commonly implicated in suppurative parotitis.

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(Choices F and G) Incentive spirometry and early ambulation can reduce postoperative pulmonary complications (eg, pneumonia), but neither prevent parotitis.

Educational objective:

Suppurative parotitis presents with exquisitely painful swelling of the parotid gland. This postoperative complication can be prevented with adequate fluid hydration and oral hygiene.

References

- Cervical lymphadenitis, suppurative parotitis, thyroiditis, and infected cysts.
- Imaging of sialadenitis.
- Acute bacterial suppurative parotitis: microbiology and management.
- Management of acute suppurative parotitis.

Surgery Ear, Nose & Throat (ENT) Acute parotitis

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A 65-year-old man comes to the office due to 3 days of progressive right flank pain. He also notes 4 weeks of dysuria and urinary frequency. The patient has a history of coronary artery disease and hypertension. His father died from prostate cancer. Temperature is 37.1 C (98.8 F), blood pressure is 130/86 mm Hg, pulse is 82/min, and respirations are 16/min. The abdomen is soft and nontender. No suprapubic tenderness is present, but there is mild right-sided costovertebral angle tenderness. The external genitalia are normal in appearance, and there is no penile discharge. Rectal examination shows mildly enlarged prostate without nodules or tenderness. Urinalysis results are as follows:

Creatinine	1.5 mg/dL
Urinalysis	
Blood	moderate
Bacteria	none
Red blood cells	30-40/hpf
Casts	none
Dysmorphic cells	none

Urine gram stain is negative, and urine culture does not grow any organisms. Abdominal ultrasound reveals right-sided hydronephrosis and a normal left-sided kidney and ureter. Which of the following is the most appropriate next step?

- ☐ A. Cystoscopy
- ☐ B. Foley catheter placement
- ☐ C. Prostate biopsy
- ☐ D. Prostate specific antigen level
- ☐ E. Repeat urinalysis in 3 months

Urinalysis

Blood	moderate
Bacteria	none
Red blood cells	30-40/hpf
Casts	none
Dysmorphic cells	none

Urine gram stain is negative, and urine culture does not grow any organisms. Abdominal ultrasound reveals right-sided hydronephrosis and a normal left-sided kidney and ureter. Which of the following is the most appropriate next step?

- ☐ A. Cystoscopy
- ☐ B. Foley catheter placement
- ☐ C. Prostate biopsy
- ☐ D. Prostate specific antigen level
- ☐ E. Repeat urinalysis in 3 months
- ☐ F. Testicular ultrasound
- ☐ G. Transurethral resection of prostate

Submit

Urinalysis

Blood	moderate
Bacteria	none
Red blood cells	30-40/hpf
Casts	none
Dysmorphic cells	none

Urine gram stain is negative, and urine culture does not grow any organisms. Abdominal ultrasound reveals right-sided hydronephrosis and a normal left-sided kidney and ureter. Which of the following is the most appropriate next step?

- ☒ A. Cystoscopy (72%)
- ☐ B. Foley catheter placement (11%)
- ☐ C. Prostate biopsy (2%)
- ☐ D. Prostate specific antigen level (6%)
- ☐ E. Repeat urinalysis in 3 months (2%)
- ☐ F. Testicular ultrasound (1%)
- ☐ G. Transurethral resection of prostate (2%)

Omitted

Correct answer



72%
Answered correctly



03 secs
Time Spent



03/13/2020
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Explanation

This patient's voiding symptoms (eg, dysuria, frequency), hematuria, and acute right-sided flank pain with hydronephrosis raise strong suspicion for **bladder cancer**. In the United States, most cases arise from the bladder surface epithelium (urothelium) due to chronic exposure to chemical carcinogens in the environment or in cigarette smoke. **Older adults** are most often affected and typically have ≥ 1 of the following:

- **Hematuria:** tumor growth drives the formation of new blood vessels that may bleed, leading to gross or microscopic hematuria; it is classically painless and present throughout voiding
- **Hydronephrosis:** bladder outlet or ureter obstruction by the tumor leads to hydronephrosis, which can be associated with flank pain and acute renal insufficiency (eg, elevated creatinine), as seen in this patient
- **Voiding symptoms:** bladder tumors can reduce bladder capacity, cause detrusor muscle hyperactivity, or result in bladder neck/urethra obstruction, leading to voiding manifestations such as nocturia, frequency, urgency, and dysuria

Adults age >40 who have painless hematuria require prompt investigation for bladder cancer when no evidence of infection (eg, dysuria, pyuria, bacteriuria), glomerulonephritis (eg, red blood cell casts, dysmorphic red blood cells), or nephrolith are present. The gold-standard initial test is **urinary cystoscopy**, which allows direct visualization of the bladder wall and biopsy of suspicious masses. Abdominal CT is then generally necessary for staging.

(Choices B and G) Older men with benign prostatic hyperplasia often have hematuria and chronic voiding symptoms and can sometimes develop acute urinary tract obstruction, which requires decompression with a Foley catheter. However, prostatic urinary obstruction usually causes bilateral (not unilateral) hydronephrosis because it is below the level of the bladder. Unilateral hydronephrosis is usually decompressed with ureteral stent (not Foley catheter). Patients with benign prostatic hyperplasia who have recurrent urinary obstruction or significant lower urinary symptoms sometimes require transurethral prostate resection.

(Choices C and D) Prostate biopsy and prostate-specific antigen help evaluate for prostatic cancer, which is often (but not always) associated with a prostatic nodule on examination. Hematuria and acute urinary retention are rare in prostate cancer because most tumors form in the periphery of the prostate, not in the periurethral zone.

(Choice E) Patients with unexplained, painless hematuria require urgent evaluation for bladder and kidney cancer. Furthermore, individuals with

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Adults age >40 who have painless hematuria require prompt investigation for bladder cancer when no evidence of infection (eg, dysuria, pyuria, bacteriuria), glomerulonephritis (eg, red blood cell casts, dysmorphic red blood cells), or nephrolith are present. The gold-standard initial test is **urinary cystoscopy**, which allows direct visualization of the bladder wall and biopsy of suspicious masses. Abdominal CT is then generally necessary for staging.

(Choices B and G) Older men with benign prostatic hyperplasia often have hematuria and chronic voiding symptoms and can sometimes develop acute urinary tract obstruction, which requires decompression with a Foley catheter. However, prostatic urinary obstruction usually causes bilateral (not unilateral) hydronephrosis because it is below the level of the bladder. Unilateral hydronephrosis is usually decompressed with ureteral stent (not Foley catheter). Patients with benign prostatic hyperplasia who have recurrent urinary obstruction or significant lower urinary symptoms sometimes require transurethral prostate resection.

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(Choice E) Patients with unexplained, painless hematuria require urgent evaluation for bladder and kidney cancer. Furthermore, individuals with hydronephrosis require urgent decompression in order to prevent kidney damage.

(Choice F) Bilateral testicular ultrasound is indicated for testicular cancer, which usually presents in young males (age 15-35) with unilateral testicular nodule or swelling. Hematuria and hydronephrosis are uncommon.

Educational objective:

Bladder cancer is common in older adults and often presents with hematuria, voiding symptoms (eg, dysuria, frequency), and/or hydronephrosis with flank pain. Urgent cystoscopy is required to visualize the bladder wall and to biopsy suspicious masses.

Surgery

Renal, Urinary Systems & Electrolytes

Bladder cancer

Subject

System

Topic

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Question Id: 2362



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Settings

A 35-year-old woman is being evaluated for a breast mass first noticed during a routine physical examination last week. The patient had bilateral reduction mammoplasty for mammary hyperplasia 2 years ago. She takes no medications and has no allergies; her paternal grandmother died at age 65 of breast cancer. Breast examination shows a fixed mass palpated in the upper outer quadrant of the right breast. Mammography shows a 3 x 3-cm spiculated mass with coarse calcifications in the upper outer quadrant of the right breast. Ultrasonography of the breast shows a hyperechoic mass. Core biopsy shows foamy macrophages and fat globules, and the mass is excised with concordant pathologic findings. Which of the following is the most appropriate course of action in management of this patient?

- ☐ A. Axillary node dissection
- ☐ B. MRI of the breast
- ☐ C. Radiation therapy
- ☐ D. Reassurance and routine follow-up
- ☐ E. Simple mastectomy

Submit



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A 35-year-old woman is being evaluated for a breast mass first noticed during a routine physical examination last week. The patient had bilateral reduction mammoplasty for mammary hyperplasia 2 years ago. She takes no medications and has no allergies; her paternal grandmother died at age 65 of breast cancer. Breast examination shows a fixed mass palpated in the upper outer quadrant of the right breast. Mammography shows a 3 x 3-cm spiculated mass with coarse calcifications in the upper outer quadrant of the right breast. Ultrasonography of the breast shows a hyperechoic mass. Core biopsy shows foamy macrophages and fat globules, and the mass is excised with concordant pathologic findings. Which of the following is the most appropriate course of action in management of this patient?

- ☐ A. Axillary node dissection (18%)
- ☐ B. MRI of the breast (2%)
- ☐ C. Radiation therapy (5%)
- ☒ D. Reassurance and routine follow-up (70%)
- ☐ E. Simple mastectomy (3%)

Omitted

Correct answer
D

70%
Answered correctly

02 secs
Time Spent

05/03/2020
Last Updated

Explanation

Benign breast disease	
Diagnosis	Clinical features

Benign breast disease	
Diagnosis	Clinical features
Breast cyst	• Solitary, well-circumscribed, mobile mass • ± Tenderness
Fibrocystic changes	• Multiple, diffuse nodulocystic masses • Cyclic premenstrual tenderness
Fibroadenoma	• Solitary, well-circumscribed, mobile mass • Cyclic premenstrual tenderness
Fat necrosis	• Post trauma/surgery • Firm, irregular mass • ± Ecchymosis, skin/nipple retraction

This patient most likely has **fat necrosis** of the breast. This **benign** condition is associated with breast surgery (eg, breast reduction/reconstruction) and trauma (eg, seatbelt injury). Fat necrosis can mimic breast cancer in its clinical and radiographic presentation because it commonly presents as a **fixed mass** with skin or nipple retraction and gives the appearance of **calcifications** on mammography. Ultrasonography can demonstrate a hyperechoic mass, which often correlates with a benign etiology. Biopsy is diagnostic and typically shows fat globules and foamy histiocytes.

Despite benign biopsy results, the entire mass is often excised due to concerning findings of calcifications on mammography and a fixed irregular mass on clinical examination. Once the diagnosis is confirmed with pathologic analysis, routine annual screening is sufficient as the risk of breast cancer is not increased.

(Choices A, C, and E) Radiation and surgery are not indicated for this nonmalignant condition. Prophylactic mastectomy can be considered in patients with a strong family history of breast cancer, such as a patient with ≥ 1 first-degree relatives with breast cancer before age 50, or a

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Despite benign biopsy results, the entire mass is often excised due to concerning findings of calcifications on mammography and a fixed irregular mass on clinical examination. Once the diagnosis is confirmed with pathologic analysis, routine annual screening is sufficient as the risk of breast cancer is not increased.

(Choices A, C, and E) Radiation and surgery are not indicated for this nonmalignant condition. Prophylactic mastectomy can be considered in patients with a strong family history of breast cancer, such as a patient with ≥ 1 first-degree relatives with breast cancer before age 50, or a hereditary oncogenic mutation.

(Choice B) MRI of the breast is used for the screening of high-risk patients (eg, *BRCA* carrier, first-degree relative of known *BRCA* carrier) and the evaluation of disease extent and chemotherapy response in breast cancer patients. Further imaging is not necessary with this patient as excisional biopsy confirmed a benign condition.

Educational objective:

Fat necrosis of the breast is a benign condition with clinical and radiographic findings similar to breast cancer, including skin or nipple retraction and calcifications on mammography. Biopsy will reveal fat globules and foamy histiocytes in fat necrosis. No further workup is indicated for excised lesions.

References

- Mimickers of breast malignancy on breast sonography.
- Fat necrosis of the breast--a review.
- Hyperechoic lesions of the breast: radiologic-histopathologic correlation.

SurgeryFemale Reproductive System & BreastBreast mass

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A 44-year-old-woman comes to the emergency department due to worsening abdominal pain. Two weeks ago, the patient underwent a laparoscopic hysterectomy and bilateral salpingo-oophorectomy for adenomyosis. Her postoperative course was unremarkable, and the patient went home the day after the procedure. She was eating normally until 2 days ago, when she began experiencing increasing nausea and abdominal cramping after meals. Now, the patient has abdominal cramping every few minutes and has vomited her pain medication. Her last bowel movement was 3 days ago, and she has not passed flatus today. Vital signs are within normal limits. BMI is 34 kg/m². The abdomen is distended and tympanic on percussion. There is abdominal tenderness to palpation, but no rebound or guarding. The skin is intact over all the abdominal incisions, but the right-sided incision has an underlying tender, palpable mass. Bowel sounds are hyperactive. Abdominal x-ray reveals multiple air-fluid levels within the small bowel and no air in the rectum. A nasogastric tube is placed. Which of the following is the best next step in management of this patient?

- ☐ A. Abdominal ultrasound
- ☐ B. Barium enema
- ☐ C. Bowel rest and serial abdominal examinations
- ☐ D. Digital fecal disimpaction
- ☐ E. Emergency laparotomy
- ☐ F. Small bowel follow-through

Submit

A 44-year-old-woman comes to the emergency department due to worsening abdominal pain. Two weeks ago, the patient underwent a laparoscopic hysterectomy and bilateral salpingo-oophorectomy for adenomyosis. Her postoperative course was unremarkable, and the patient went home the day after the procedure. She was eating normally until 2 days ago, when she began experiencing increasing nausea and abdominal cramping after meals. Now, the patient has abdominal cramping every few minutes and has vomited her pain medication. Her last bowel movement was 3 days ago, and she has not passed flatus today. Vital signs are within normal limits. BMI is 34 kg/m². The abdomen is distended and tympanic on percussion. There is abdominal tenderness to palpation, but no rebound or guarding. The skin is intact over all the abdominal incisions, but the right-sided incision has an underlying tender, palpable mass. Bowel sounds are hyperactive. Abdominal x-ray reveals multiple air-fluid levels within the small bowel and no air in the rectum. A nasogastric tube is placed. Which of the following is the best next step in management of this patient?

- ☐ A. Abdominal ultrasound (6%)
- ☐ B. Barium enema (4%)
- ☐ C. Bowel rest and serial abdominal examinations (31%)
- ☐ D. Digital fecal disimpaction (2%)
- ☒ E. Emergency laparotomy (47%)
- ☐ F. Small bowel follow-through (8%)

Omitted
Correct answer
E

47%
Answered correctly

02 secs
Time Spent

03/25/2020
Last Updated

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Small-bowel obstruction	
Clinical presentation	- Colicky abdominal pain, vomiting - Inability to pass flatus or stool if complete (no obstipation if partial) - Hyperactive → absent bowel sounds - Distended & tympanitic abdomen
Diagnosis	- Dilated loops of bowel with air-fluid levels on plain film or CT scan - Partial: air in colon - Complete: transition point (abrupt cutoff), no air in colon
Complications	- Ischemia/necrosis (strangulation) - Bowel perforation
Management	- Bowel rest, nasogastric tube suction, intravenous fluids - Surgical exploration for signs of complications

This patient with abdominal pain, vomiting, and obstipation (ie, no bowel movements or flatus) likely has a **small bowel obstruction (SBO)**. In the setting of recent surgery and a tender, palpable mass at the level of the incision, her obstruction is likely caused by an **incisional hernia**. Incisional hernias can develop at the site of any abdominal incision and reflect a breakdown in fascial closure. Obesity appears to be an important risk factor. Although most cases present as an asymptomatic abdominal mass, obstruction can occur, particularly with smaller hernias, because bowel can remain trapped within the small fascial defect.

SBO typically causes **vomiting** and **abdominal distension** due to backup of gastric secretions and intestinal gas. **Colicky pain** after meals is also common due to unproductive bowel peristalsis against the obstruction, with hyperactive bowel sounds in the early stages. SBO treatment depends on disease severity. Partial SBO, in which the bowel lumen is narrowed but not completely obstructed, typically improves with conservative management (ie, bowel rest, nasogastric tube insertion for bowel decompression, serial abdominal examinations).

In contrast, those with a **complete SBO (no flatus, no air in the rectum on x-ray)**, such as this patient, are at increased risk of **life-threatening complications** (eg, bowel ischemia, perforation) that will not resolve with conservative management (**Choice C**). Therefore, in addition to

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SBO typically causes **vomiting** and **abdominal distension** due to backup of gastric secretions and intestinal gas. **Colicky pain** after meals is also common due to unproductive bowel peristalsis against the obstruction, with hyperactive bowel sounds in the early stages. SBO treatment depends on disease severity. Partial SBO, in which the bowel lumen is narrowed but not completely obstructed, typically improves with conservative management (ie, bowel rest, nasogastric tube insertion for bowel decompression, serial abdominal examinations).

In contrast, those with a **complete SBO (no flatus, no air in the rectum on x-ray)**, such as this patient, are at increased risk of **life-threatening complications** (eg, bowel ischemia, perforation) that will not resolve with conservative management (**Choice C**). Therefore, in addition to nasogastric tube insertion for gastric decompression, these patients require **emergency laparotomy** to relieve the obstruction and resolve any underlying etiology (eg, incisional hernia, intraabdominal adhesions).

(Choices A and F) Further imaging studies (eg, abdominal ultrasound, small bowel follow-through) are not needed in patients with complete SBO diagnosed on abdominal x-ray (eg, no rectal gas). This patient requires emergency surgery; additional testing delays treatment and increases the risk of complications.

(Choices B and D) Barium enemas and digital fecal disimpaction are used to treat constipation, a large bowel disorder that appears on abdominal x-ray as impacted stool in the rectum. Neither intervention affects the small bowel.

Educational objective:

Patients with a complete small bowel obstruction (eg, obstipation, no air in the rectum on abdominal x-ray) require nasogastric tube insertion for gastric decompression plus emergency laparotomy due to the high risk of life-threatening complications (eg, bowel ischemia, perforation).

References

- Emergency medicine evaluation and management of small bowel obstruction: evidence-based recommendations.
- Adhesion-related small bowel obstruction.

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SBO typically causes **vomiting** and **abdominal distension** due to backup of gastric secretions and intestinal gas. **Colicky pain** after meals is also common due to unproductive bowel peristalsis against the obstruction, with hyperactive bowel sounds in the early stages. SBO treatment depends on disease severity. Partial SBO, in which the bowel lumen is narrowed but not completely obstructed, typically improves with conservative management (ie, bowel rest, nasogastric tube insertion for bowel decompression, serial abdominal examinations).

In contrast, those with a **complete SBO (no flatus, no air in the rectum** on x-ray), such as this patient, are at increased risk of **life-threatening complications** (eg, bowel ischemia, perforation) that will not resolve with conservative management (**Choice C**). Therefore, in addition to nasogastric tube insertion for gastric decompression, these patients require **emergency laparotomy** to relieve the obstruction and resolve any underlying etiology (eg, incisional hernia, intraabdominal adhesions).

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Educational objective:

Patients with a complete small bowel obstruction (eg, obstipation, no air in the rectum on abdominal x-ray) require nasogastric tube insertion for gastric decompression plus emergency laparotomy due to the high risk of life-threatening complications (eg, bowel ischemia, perforation).

References

- [Emergency medicine evaluation and management of small bowel obstruction: evidence-based recommendations.](#)
- [Adhesion-related small bowel obstruction.](#)
- [A systematic review of the clinical presentation, diagnosis, and treatment of small bowel obstruction.](#)

Surgery

Female Reproductive System & Breast

Incisional hernia

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A 60-year-old man is evaluated for a right lung mass, which was discovered on a chest x-ray performed one month ago due to persistent cough. He has had no chest pain, dyspnea, or hemoptysis. The patient has no other medical conditions and takes no medications. He is an ex-smoker with a 20-pack-year history. Physical examination shows clear lungs, normal heart sounds, and no lymphadenopathy or abdominal organomegaly. CT scan shows a 4-cm mass in the right oblique fissure with no enlarged lymph nodes. Bronchoscopy-guided biopsy reveals squamous cell carcinoma. A subsequent PET scan shows no metastatic lesions, and a right pneumonectomy is planned. Which of the following is likely to provide the best assessment of postoperative pulmonary morbidity in this patient?

- ☐ A. End-tidal CO₂ level
- ☐ B. FEV1
- ☐ C. Maximal inspiratory pressure
- ☐ D. Oxygen saturation during exercise
- ☐ E. Residual volume to total lung capacity ratio

Submit

A 60-year-old man is evaluated for a right lung mass, which was discovered on a chest x-ray performed one month ago due to persistent cough. He has had no chest pain, dyspnea, or hemoptysis. The patient has no other medical conditions and takes no medications. He is an ex-smoker with a 20-pack-year history. Physical examination shows clear lungs, normal heart sounds, and no lymphadenopathy or abdominal organomegaly. CT scan shows a 4-cm mass in the right oblique fissure with no enlarged lymph nodes. Bronchoscopy-guided biopsy reveals squamous cell carcinoma. A subsequent PET scan shows no metastatic lesions, and a right pneumonectomy is planned. Which of the following is likely to provide the best assessment of postoperative pulmonary morbidity in this patient?

- ☐ A. End-tidal CO₂ level (13%)
- ☒ B. FEV1 (50%)
- ☐ C. Maximal inspiratory pressure (4%)
- ☐ D. Oxygen saturation during exercise (10%)
- ☐ E. Residual volume to total lung capacity ratio (21%)

Omitted

Correct answer B

50% Answered correctly

02 secs Time Spent

06/22/2020 Last Updated

Explanation

Indications for **lung resection** include malignancy, severe chronic obstructive pulmonary disease (COPD), and persistent infection despite medical treatment. An important consideration prior to lung resection is whether the patient has enough pulmonary reserve to maintain adequate lung function following surgery. **FEV1** and **diffusion capacity of the lung for carbon monoxide** (DLCO), obtained by preoperative pulmonary function testing, are the best predictors of postoperative outcomes following lung resection surgery.

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Indications for **lung resection** include malignancy, severe chronic obstructive pulmonary disease (COPD), and persistent infection despite medical treatment. An important consideration prior to lung resection is whether the patient has enough pulmonary reserve to maintain adequate lung function following surgery. **FEV1** and **diffusion capacity of the lung for carbon monoxide** (DLCO), obtained by preoperative pulmonary function testing, are the **best predictors** of **postoperative outcomes** following lung resection surgery.

Based on preoperative FEV1 and DLCO measurements, the percentage of planned lung resection (eg, approximately 50% in unilateral pneumonectomy) is used to estimate postoperative FEV1 and DLCO. Patients with an estimated postoperative FEV1 or DLCO of <40% are at elevated risk of postoperative morbidity.

(Choice A) End-tidal CO₂ measurement (capnography) is indicative of aerobic metabolism and can be used to monitor correct endotracheal tube placement or to measure the effectiveness of cardiopulmonary resuscitation.

(Choice C) Maximal inspiratory pressure (or negative inspiratory force) is a measurement of inspiratory muscle strength. It is often used to monitor patients with hypoventilation due to neuromuscular disease (eg, myasthenia gravis, Guillain-Barré syndrome) and help assess the need for mechanical ventilation.

(Choice D) Measurement of oxygen saturation during exercise is used to evaluate the need for home supplemental oxygen therapy in patients with COPD.

(Choice E) The ratio of residual volume to total lung capacity increases in patients with COPD due to air trapping and lung hyperinflation; a high ratio correlates with poorer overall outcomes in patients with COPD, but it is not predictive of postoperative outcomes following lung resection.

Educational objective:

FEV1 and diffusion capacity of the lung for carbon monoxide (DLCO) are the best predictors of postoperative outcomes following lung resection surgery.

References

- Brunelli A, Kim AW, Berger KI, Addrizzo-Harris DJ. Physiologic evaluation of the patient with lung cancer being considered for resectional surgery: diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines.

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A 55-year-old woman comes to the hospital due to fever, chills, left flank pain, and dysuria for 2 days. She was treated for a urinary tract infection twice in the past 3 months, the latest being 4 weeks ago. Both times, the patient was compliant with antibiotic treatment and her symptoms improved. She has no other medical problems and takes no medications. Temperature is 39 C (102.2 F), blood pressure is 110/70 mm Hg, pulse is 90/min, and respirations are 16/min. BMI is 40 kg/m². Examination shows left costovertebral angle tenderness. Laboratory results are as follows:

Complete blood count		
Hemoglobin		12 g/dL
Leukocytes		13,000/mm ³
Urinalysis		
Blood		moderate
Glucose		negative
Leukocyte esterase		positive
Nitrites		positive
White blood cells		20-30/hpf
Red blood cells		20-30/hpf
Casts		none

Kidney ultrasound shows a 1.3-cm, irregularly shaped stone in the left renal pelvis. Which of the following is the most likely mechanism of stone formation in this patient?

☐ A. Decreased renal reabsorption of calcium

Urinalysis

Blood	moderate
Glucose	negative
Leukocyte esterase	positive
Nitrites	positive
White blood cells	20-30/hpf
Red blood cells	20-30/hpf
Casts	none

Kidney ultrasound shows a 1.3-cm, irregularly shaped stone in the left renal pelvis. Which of the following is the most likely mechanism of stone formation in this patient?

- ☐ A. Decreased renal reabsorption of calcium
- ☐ B. Decreased renal reabsorption of uric acid
- ☐ C. Increased intestinal absorption of calcium
- ☐ D. Increased intestinal absorption of oxalate
- ☐ E. Increased production of uric acid
- ☐ F. Increased urine ammonia production

Submit

Urinalysis

Blood	moderate
Glucose	negative
Leukocyte esterase	positive
Nitrites	positive
White blood cells	20-30/hpf
Red blood cells	20-30/hpf
Casts	none

Kidney ultrasound shows a 1.3-cm, irregularly shaped stone in the left renal pelvis. Which of the following is the most likely mechanism of stone formation in this patient?

- ☐ A. Decreased renal reabsorption of calcium (9%)
- ☐ B. Decreased renal reabsorption of uric acid (2%)
- ☐ C. Increased intestinal absorption of calcium (2%)
- ☐ D. Increased intestinal absorption of oxalate (8%)
- ☐ E. Increased production of uric acid (6%)
- ☒ F. Increased urine ammonia production (70%)

Omitted

Correct answer



70%
Answered correctly



05 secs
Time Spent



02/05/2020
Last Updated

Struvite (magnesium ammonium phosphate) stones	
Risk factors	- Recurrent upper urinary tract infection - Urease-producing organisms (eg, <i>Klebsiella</i>, <i>Proteus</i>)
Pathogenesis	- Hydrolysis of urea to yield ammonia: $\text{Urea} \rightarrow 2 \text{NH}_3 + \text{CO}_2$$\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$ - Increased urine pH - Precipitation of magnesium ammonium phosphate salts
Clinical features	- Large staghorn calculi - Fever, mild flank pain due to infection - Obstruction of collecting system & atrophy of renal parenchyma

This patient has a large, irregular **kidney stone** associated with fever and a history of **recurrent urinary tract infections**. This presentation suggests a magnesium ammonium phosphate (**struvite**) stone. Struvite stones are caused by urease-producing organisms (eg, *Proteus*, *Klebsiella*). Hydrolysis of urea yields ammonia, which alkalinizes the urine and facilitates the precipitation of struvite crystals.

Because of the large quantities of urea excreted in urine, these stones can grow very rapidly and fill the renal calyces (staghorn calculi). The large size of these calculi prevents them from passing into the ureter, so patients typically have symptoms related to associated recurrent infections rather than acute renal colic.

If left untreated, the stones can seed further infections, and chronic infection and obstruction can lead to loss of kidney function. Eradication of staghorn calculi is difficult; antibiotics alone do not eliminate the source of the infection because bacteria grow within the stone matrix. **Stone removal** (eg, percutaneous nephrolithotomy) is typically recommended, and nephrectomy may be required for patients with a chronically infected, nonfunctioning kidney.

(Choice A) Hyperparathyroidism is associated with an increased risk for calcium stones; although parathyroid hormone increases renal reabsorption of calcium, the increased release of calcium from bone leads to an increased filtered calcium load and net calcium excretion. In

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This patient has a large, irregular **kidney stone** associated with fever and a history of **recurrent urinary tract infections**. This presentation suggests a magnesium ammonium phosphate (**struvite**) stone. Struvite stones are caused by urease-producing organisms (eg, *Proteus*, *Klebsiella*). Hydrolysis of urea yields ammonia, which alkalizes the urine and facilitates the precipitation of struvite crystals.

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If left untreated, the stones can seed further infections, and chronic infection and obstruction can lead to loss of kidney function. Eradication of staghorn calculi is difficult; antibiotics alone do not eliminate the source of the infection because bacteria grow within the stone matrix. **Stone removal** (eg, percutaneous nephrolithotomy) is typically recommended, and nephrectomy may be required for patients with a chronically infected, nonfunctioning kidney.

(Choice A) Hyperparathyroidism is associated with an increased risk for calcium stones; although parathyroid hormone increases renal reabsorption of calcium, the increased release of calcium from bone leads to an increased filtered calcium load and net calcium excretion. In contrast, hypoparathyroidism decreases renal calcium reabsorption, but because of low overall calcium levels, kidney stones are rare.

(Choices B and E) Increased production of uric acid (eg, myeloproliferative disorders) can increase the risk of uric acid stones, which form in acidic urine (impaired uric acid reabsorption is very rare). Uric acid stones are typically small, relatively uncommon, and less likely to be seen in the context of recurrent urinary tract infection.

(Choices C and D) Dietary oxalate forms complexes with calcium in the intestinal lumen and is eliminated in the feces. If intestinal concentrations of calcium are low (eg, low-calcium diet, fat malabsorption), absorption of free oxalate is increased; the increased oxalate load is filtered by the kidneys and can cause calcium oxalate stones. Although a small oxalate stone may serve as a nidus for the formation of a struvite stone, struvite formation is related primarily to urinary ammonia rather than to calcium and oxalate.

Educational objective:

Magnesium ammonium phosphate (struvite) causes large kidney stones in patients who have recurrent upper urinary tract infection with urease-producing organisms (eg, *Proteus*, *Klebsiella*). Antibiotics alone do not eliminate struvite stones, which can harbor bacteria, leading to further infection. Stone removal is usually required.

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References

- Renal struvite stones—pathogenesis, microbiology, and management strategies.

Surgery

Renal, Urinary Systems & Electrolytes

Renal calculi

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A 58-year-old woman is evaluated due to increasing leakage of fluid from her abdominal incision. The patient underwent a total abdominal hysterectomy and bilateral salpingo-oophorectomy for ovarian cancer 5 days ago and initially had a normal postoperative course. However, after walking the hallway this morning, she had increasing fluid leakage and a bulge at her incision site. The patient has had no increase in pain and is continuing to tolerate a regular diet and pass flatus. Temperature is 36.7 C (98.1 F), blood pressure is 144/92 mm Hg, and pulse is 88/min. BMI is 40 kg/m². Palpation of the abdomen shows no rebound or guarding. The vertical midline abdominal incision has surrounding erythema and a large amount of serosanguineous fluid seeping through the incision. After some of the skin staples are removed, fatty tissue and a loop of bowel are seen protruding from a separation of the rectus abdominus muscles. A moist dressing is placed over the wound. Which of the following is the best next step in management of this patient?

- ☐ A. Abdominal binder placement
- ☐ B. CT scan of the abdomen
- ☐ C. Emergency surgery
- ☐ D. Negative pressure wound therapy
- ☐ E. Wound packing with wet-to-dry dressing

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- ☐ A. Abdominal binder placement (7%)
- ☐ B. CT scan of the abdomen (2%)
- ☒ C. Emergency surgery (82%)
- ☐ D. Negative pressure wound therapy (3%)
- ☐ E. Wound packing with wet-to-dry dressing (4%)

Omitted

Correct answer
C

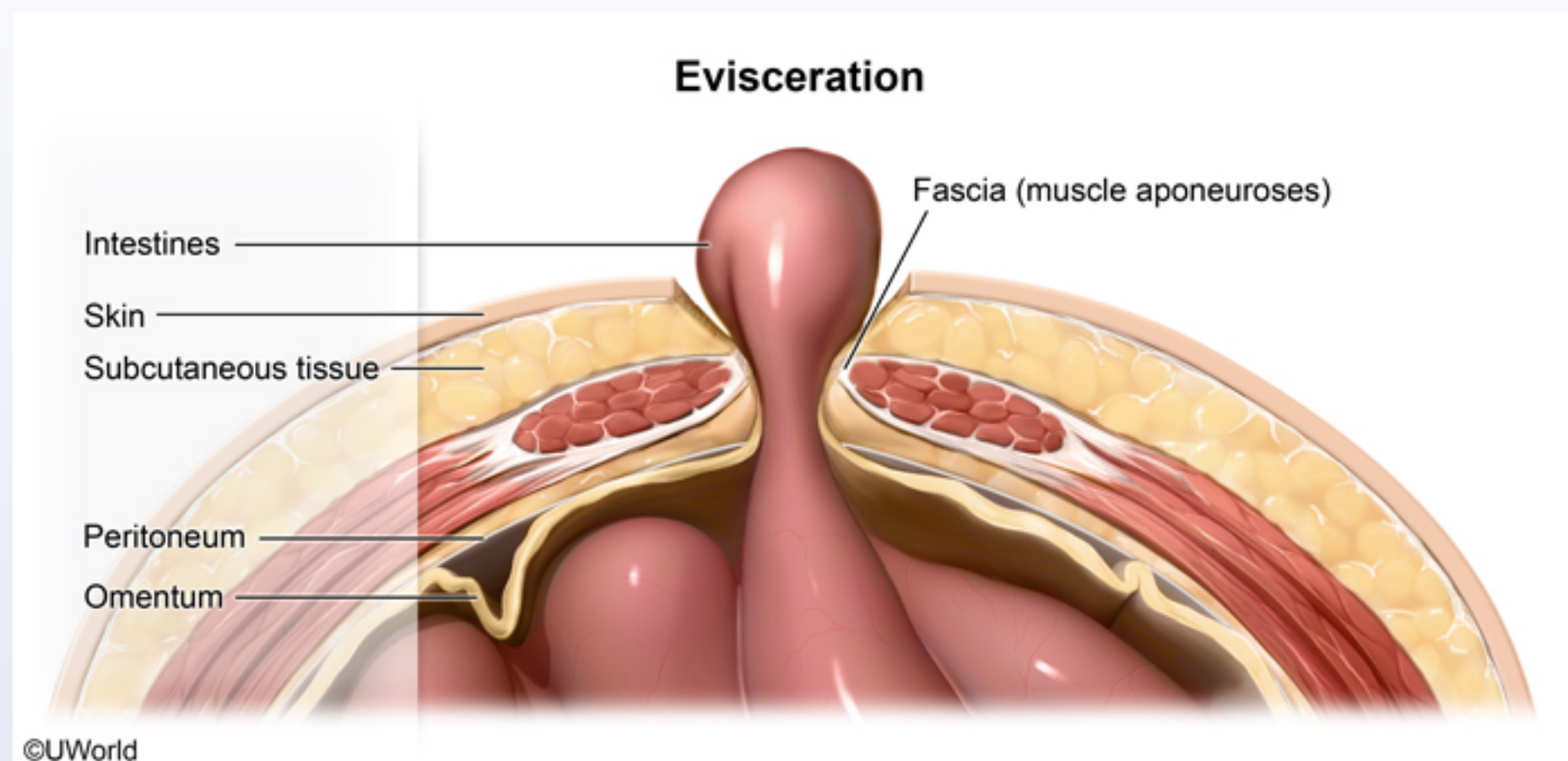
82% Answered correctly

02 secs Time Spent

04/11/2020 Last Updated

Explanation

Evisceration



Abdominal surgery can result in a variety of **postoperative wound complications** (eg, infection, dehiscence). These complications are more common after procedures with large incisions and in patients with risk factors for poor wound healing (eg, cancer, chronic corticosteroids, hypoalbuminemia) or increased intraabdominal pressure (eg, cough, obesity).

Postoperative abdominal wounds can be categorized based on fascial involvement:

- Superficial wound dehiscences are separations of the skin and subcutaneous tissue with intact rectus fascia. These typically develop within the first postoperative week due to an abnormal subcutaneous fluid buildup (eg, seroma) and can often be managed conservatively with careful dressing changes.
- Deep (fascial) wound dehiscences involve the rectus fascia (ie, nonintact) and result in exposure of the intraabdominal organs to the external environment.

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- Deep (fascial) wound dehiscences involve the rectus fascia (ie, nonintact) and result in exposure of the intraabdominal organs to the external environment.

This patient's separation of the rectus abdominus muscles with protruding fat and bowel is consistent with a deep (**fascial**) wound **dehiscence** complicated by **evisceration** (ie, herniation of underlying abdominal organs). Additional clinical features include heavy drainage of peritoneal fluid, local bulging, and a popping sensation (from fascial suture failure). Fascial dehiscence is typically seen in the first 1-2 weeks after surgery but occasionally occurs up to 30 days postoperatively. Patients with fascial dehiscence, particularly with evisceration, require **emergency surgery** because the eviscerated bowel is at risk for continued herniation and strangulation.

(Choice A) Abdominal binders may be placed briefly in preparation for surgery in patients with fascial dehiscence to prevent evisceration. They are contraindicated in patients with bowel evisceration because they can cause strangulation and perforation.

(Choice B) In cases of suspected wound dehiscence not apparent on examination, an ultrasound or CT scan may be indicated. This patient has visible evisceration; therefore, delaying surgery may increase morbidity and mortality risk.

(Choices D and E) Wound packing with saline gauze dressings is appropriate for management of superficial wound dehiscences. Negative pressure dressings are used to prevent dehiscence in high-risk wounds. This patient has a gross defect in the deep fascia, and nonoperative management is inappropriate.

Educational objective:

Deep (fascial) wound dehiscences can result in exposure or herniation (ie, evisceration) of intraabdominal organs (eg, bowel), resulting in possible

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- Deep (fascial) wound dehiscences involve the rectus fascia (ie, nonintact) and result in exposure of the intraabdominal organs to the external environment.

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(Choice A) Abdominal binders may be placed briefly in preparation for surgery in patients with fascial dehiscence to prevent evisceration. They are contraindicated in patients with bowel evisceration because they can cause strangulation and perforation.

(Choice B) In cases of suspected wound dehiscence not apparent on examination, an ultrasound or CT scan may be indicated. This patient has visible evisceration; therefore, delaying surgery may increase morbidity and mortality risk.

(Choices D and E) Wound packing with saline gauze dressings is appropriate for management of superficial wound dehiscences. Negative pressure dressings are used to prevent dehiscence in high-risk wounds. This patient has a gross defect in the deep fascia, and nonoperative management is inappropriate.

Educational objective:

Deep (fascial) wound dehiscences can result in exposure or herniation (ie, evisceration) of intraabdominal organs (eg, bowel), resulting in possible strangulation. Therefore, patients with fascial dehiscence require emergency surgery.

Surgery

Gastrointestinal & Nutrition

Wound dehiscence and evisceration

Subject

System

Topic

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TUTOR

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