1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 27-year-old man comes to the physician with complaints of cough, chest discomfort, and dyspnea on exertion. He has lost 4.53 kg (10 lb) over the past 2 months. The patient has a 10-pack-year smoking history. He drinks an average of 2 beers each weekend. He does not use illegal drugs and has not had multiple sexual partners. Physical examination is unremarkable. Chest-x ray reveals a large anterior mediastinal mass. Subsequent blood work shows elevated levels of beta-human chorionic gonadotropin and alpha fetoprotein. What is the most likely diagnosis?

A. Benign teratoma
B. Bronchogenic cysts
C. Choriocarcinoma
D. Hepatocellular carcinoma
E. Histoplasmosis
F. Hodgkin lymphoma
G. Nonseminomatous germ cell tumors
H. Retrosternal goiter
I. Seminoma
J. Thymoma

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 27-year-old man comes to the physician with complaints of cough, chest discomfort, and dyspnea on exertion. He has lost 4.53 kg (10 lb) over the past 2 months. The patient has a 10-pack-year smoking history. He drinks an average of 2 beers each weekend. He does not use illegal drugs and has not had multiple sexual partners. Physical examination is unremarkable. Chest-x ray reveals a large anterior mediastinal mass. Subsequent blood work shows elevated levels of beta-human chorionic gonadotropin and alpha fetoprotein. What is the most likely diagnosis?

A. Benign teratoma (14%)
B. Bronchogenic cysts (0%)
C. Choriocarcinoma (15%)
D. Hepatocellular carcinoma (2%)
E. Histoplasmosis (0%)
F. Hodgkin lymphoma (2%)
✓ G. Nonseminomatous germ cell tumors (45%)
H. Retrosternal goiter (0%)
I. Seminoma (11%)
J. Thymoma (7%)

Omitted
Correct answer
G

45%
Answered correctly

03 secs
Time Spent

05/02/2020
Last Updated

Explanation

This patient has a large anterior mediastinal mass with elevated levels of beta-human chorionic gonadotropin (β-hCG) and alpha fetoprotein (AFP), consistent with a nonseminomatous germ cell tumor. Primary mediastinal germ cell tumors occur predominantly in young male patients and are locally invasive. β-hCG is typically elevated in both seminomatous and nonseminomatous germ cell tumors, but **nonseminomatous germ cell tumors** typically also produce **AFP**, which is not produced by seminomas **(Choice I)**. A large mediastinal mass with associated elevations of AFP and β-hCG is virtually diagnostic of a nonseminomatous germ cell tumor.

The diagnosis can be confirmed with biopsy. Testicular ultrasound should be performed to exclude a small primary tumor as management and prognosis differ between primary mediastinal and metastatic germ cell tumors. Almost all germ cell tumors in the anterior mediastinum are primary rather than metastatic.

(Choice A) Benign teratomas typically include tissue from all 3 germ layers and may present as mediastinal tumors. However, they do not produce tumor markers.

(Choice B) Bronchogenic cysts are uncommon causes of anterior mediastinal masses. They are congenital and arise due to abnormal development of the foregut, although symptoms may not develop until late childhood or early adulthood. They appear as fluid-filled or air/fluid-filled cystic structures on imaging. Elevated AFP and β-hCG are not associated.

(Choice C) Choriocarcinoma is a form of gestational trophoblastic disease that usually occurs in the setting of a molar pregnancy. β-hCG levels are increased significantly.

(Choice D) Hepatocellular carcinoma typically occurs in the setting of cirrhosis or chronic viral hepatitis. It may cause elevations of AFP but not β-hCG.

(Choice E) Infection with histoplasmosis may occasionally cause significant mediastinal adenopathy (mediastinal granuloma). It would not cause a rise in tumor markers.

(Choice F) Hodgkin lymphoma is a common cause of mediastinal mass with weight loss in young patients. It also frequently involves the cervical, supraclavicular, and axillary nodes. However, elevations in AFP and β-hCG are not characteristic of Hodgkin lymphoma.

(Choice H) Retrosternal goiters usually manifest with compressive symptoms such as dyspnea, cough, and dysphagia. Thyroid-stimulating hormone and thyroxine may be abnormal, depending on thyroid function, but AFP and β-hCG would be normal.

(Choice B) Bronchogenic cysts are uncommon causes of anterior mediastinal masses. They are congenital and arise due to abnormal development of the foregut, although symptoms may not develop until late childhood or early adulthood. They appear as fluid-filled or air/fluid-filled cystic structures on imaging. Elevated AFP and β-hCG are not associated.

(Choice C) Choriocarcinoma is a form of gestational trophoblastic disease that usually occurs in the setting of a molar pregnancy. β-hCG levels are increased significantly.

(Choice D) Hepatocellular carcinoma typically occurs in the setting of cirrhosis or chronic viral hepatitis. It may cause elevations of AFP but not β-hCG.

(Choice E) Infection with histoplasmosis may occasionally cause significant mediastinal adenopathy (mediastinal granuloma). It would not cause a rise in tumor markers.

(Choice F) Hodgkin lymphoma is a common cause of mediastinal mass with weight loss in young patients. It also frequently involves the cervical, supraclavicular, and axillary nodes. However, elevations in AFP and β-hCG are not characteristic of Hodgkin lymphoma.

(Choice H) Retrosternal goiters usually manifest with compressive symptoms such as dyspnea, cough, and dysphagia. Thyroid-stimulating hormone and thyroxine may be abnormal, depending on thyroid function, but AFP and β-hCG would be normal.

(Choice J) Thymoma is a neoplasm of the thymus classically associated with systemic syndromes, including myasthenia gravis and pemphigus.

Educational objective:
Germ cell tumors typically affect young patients and display aggressive biologic behavior. Nonseminomatous germ cell tumors typically produce both alpha fetoprotein and human chorionic gonadotropin tumor markers.

References

- Extragonadal germ cell tumors: clinical presentation and management.

Surgery	Pulmonary & Critical Care	Extragonadal germ cell tumor
Subject	System	Topic

Copyright © UWorld. All rights reserved.

A 56-year-old man is admitted to the intensive care unit after being hospitalized 3 days ago for sepsis and acute respiratory failure due to community-acquired pneumonia. Medical history is remarkable for hypertension and moderate aortic stenosis that was last evaluated by echocardiography 2 years ago. On admission, the patient was intubated and placed on mechanical ventilation. He was also treated with intravenous fluids and antibiotics and required vasopressor therapy for 12 hours, after which he showed clinical improvement. While still intubated this morning, the patient develops sudden-onset hypotension and tachycardia. Temperature is 98.6 F (37 C), blood pressure is 82/54 mm Hg, pulse is 120/min, and respirations are 26/min. Cardiac examination shows regular rhythm with a rapid rate, and lung auscultation reveals bilateral breath sounds with crackles in the right lower lung field. The patient is rapidly infused with 2 L of normal saline with minimal improvement in his blood pressure. Pulmonary arterial catheterization is performed and shows:

Central venous pressure	14 mm Hg (normal: 6-8)
Pulmonary capillary wedge pressure	6 mm Hg (normal: 6-12)

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

A. Aortic dissection
B. Gram-negative sepsis
C. Left ventricular failure
D. Pulmonary embolism
E. Severe aortic stenosis

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 56-year-old man is admitted to the intensive care unit after being hospitalized 3 days ago for sepsis and acute respiratory failure due to community-acquired pneumonia. Medical history is remarkable for hypertension and moderate aortic stenosis that was last evaluated by echocardiography 2 years ago. On admission, the patient was intubated and placed on mechanical ventilation. He was also treated with intravenous fluids and antibiotics and required vasopressor therapy for 12 hours, after which he showed clinical improvement. While still intubated this morning, the patient develops sudden-onset hypotension and tachycardia. Temperature is 98.6 F (37 C), blood pressure is 82/54 mm Hg, pulse is 120/min, and respirations are 26/min. Cardiac examination shows regular rhythm with a rapid rate, and lung auscultation reveals bilateral breath sounds with crackles in the right lower lung field. The patient is rapidly infused with 2 L of normal saline with minimal improvement in his blood pressure. Pulmonary arterial catheterization is performed and shows:

Central venous pressure	14 mm Hg (normal: 6-8)
Pulmonary capillary wedge pressure	6 mm Hg (normal: 6-12)

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

- A. Aortic dissection (6%)
- B. Gram-negative sepsis (9%)
- C. Left ventricular failure (11%)
- ✓ D. Pulmonary embolism (70%)
- E. Severe aortic stenosis (2%)

Omitted
Correct answer
D

70%
Answered correctly

02 secs
Time Spent

04/28/2020
Last Updated

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 SvO_2 are usually decreased in neurogenic shock due to impaired sympathetic reflexes.
CVP = central venous pressure; **LV** = left ventricular; **PCWP** = pulmonary capillary wedge pressure; **SvO_2** = mixed venous oxygen saturation; **SVR** = systemic vascular resistance.

This patient's pulmonary arterial catheterization findings are most consistent with **obstructive shock** due to an acute **pulmonary embolism** (PE).

This patient's pulmonary arterial catheterization findings are most consistent with **obstructive shock** due to an acute **pulmonary embolism** (PE).

The expected hemodynamic parameters in obstructive shock include **elevated central venous pressure** (CVP) and **low cardiac output**; however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary depending on the location of the obstruction.

- **Prepulmonary** obstructive shock (due to massive PE or tension pneumothorax) is most common and results from obstruction involving the right atrium, right ventricle, or pulmonary arteries. Because blood is unable to pass from the right side of the heart to the left side, **PCWP is low** or normal.
- **Postpulmonary** obstructive shock typically involves obstruction within the left side of the heart or aorta; **PCWP is elevated**, making the hemodynamic parameters the same as those expected in cardiogenic shock.

Of note, cardiac tamponade causes prepulmonary obstructive shock as blood is unable to fill the compressed right-sided heart chambers. Despite reduced left-sided preload, the expected PCWP is paradoxically elevated due to external compression of the left atrium, a rare exception when left-sided preload and PCWP are discordant.

(Choices A and E) Aortic dissection is a potential cause of postpulmonary obstructive shock because the dissecting aortic wall can create a false aortic lumen that obstructs blood flow in the true aortic lumen. Severe aortic stenosis can also cause postpulmonary obstructive shock. Elevated PCWP is expected with these postpulmonary obstructions. Aortic dissection may also cause hemorrhagic (hypovolemic) shock; however, low CVP is expected.

(Choice B) Low CVP and low PCWP are expected in septic shock.

(Choice C) Left ventricular failure can result from acute myocardial infarction and leads to cardiogenic shock characterized by elevated CVP and PCWP. Right ventricular myocardial infarction and failure will demonstrate elevated CVP and low or normal PCWP, the same findings expected in prepulmonary obstructive shock.

Educational objective:
Most cases of obstructive shock result from prepulmonary obstruction (eg, due to massive pulmonary embolism or tension pneumothorax) with hemodynamic parameters showing high central venous pressure (CVP), low pulmonary capillary wedge pressure (PCWP), and low cardiac output. Postpulmonary obstructive shock (eg, due to aortic dissection or severe aortic stenosis) leads to the same findings as cardiogenic shock with high CVP, high PCWP, and low cardiac output.

right atrium, right ventricle, or pulmonary arteries. Because blood is unable to pass from the right side of the heart to the left side, **PCWP is low** or normal.

- **Postpulmonary** obstructive shock typically involves obstruction within the left side of the heart or aorta; **PCWP is elevated**, making the hemodynamic parameters the same as those expected in cardiogenic shock.

Of note, cardiac tamponade causes prepulmonary obstructive shock as blood is unable to fill the compressed right-sided heart chambers. Despite reduced left-sided preload, the expected PCWP is paradoxically elevated due to external compression of the left atrium, a rare exception when left-sided preload and PCWP are discordant.

(Choices A and E) Aortic dissection is a potential cause of postpulmonary obstructive shock because the dissecting aortic wall can create a false aortic lumen that obstructs blood flow in the true aortic lumen. Severe aortic stenosis can also cause postpulmonary obstructive shock. Elevated PCWP is expected with these postpulmonary obstructions. Aortic dissection may also cause hemorrhagic (hypovolemic) shock; however, low CVP is expected.

(Choice B) Low CVP and low PCWP are expected in septic shock.

(Choice C) Left ventricular failure can result from acute myocardial infarction and leads to cardiogenic shock characterized by elevated CVP and PCWP. Right ventricular myocardial infarction and failure will demonstrate elevated CVP and low or normal PCWP, the same findings expected in prepulmonary obstructive shock.

Educational objective:
Most cases of obstructive shock result from prepulmonary obstruction (eg, due to massive pulmonary embolism or tension pneumothorax) with hemodynamic parameters showing high central venous pressure (CVP), low pulmonary capillary wedge pressure (PCWP), and low cardiac output. Postpulmonary obstructive shock (eg, due to aortic dissection or severe aortic stenosis) leads to the same findings as cardiogenic shock with high CVP, high PCWP, and low cardiac output.

Surgery	Pulmonary & Critical Care	Obstructive shock
Subject	System	Topic

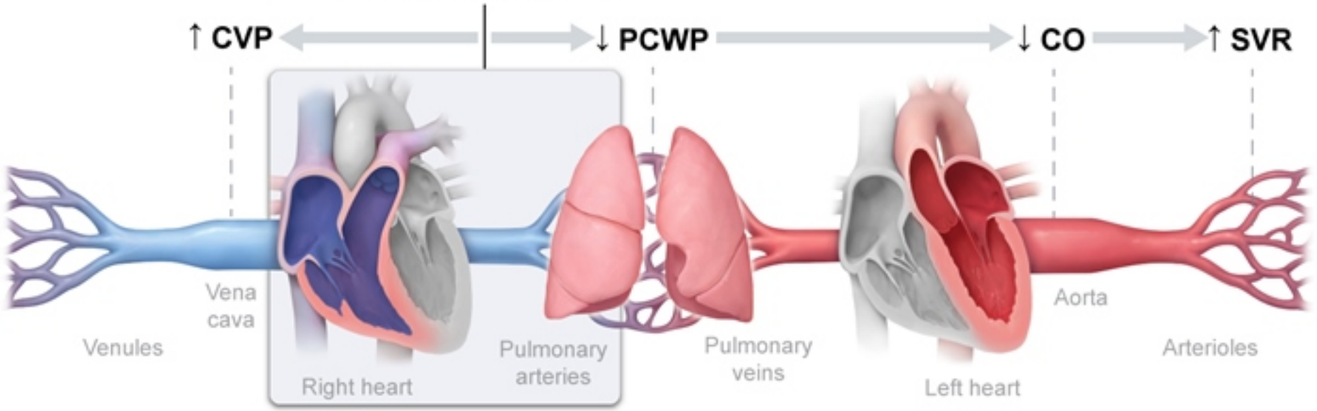
Copyright © UWorld. All rights reserved.

however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary

Exhibit Display

Obstructive shock (prepulmonary)

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.

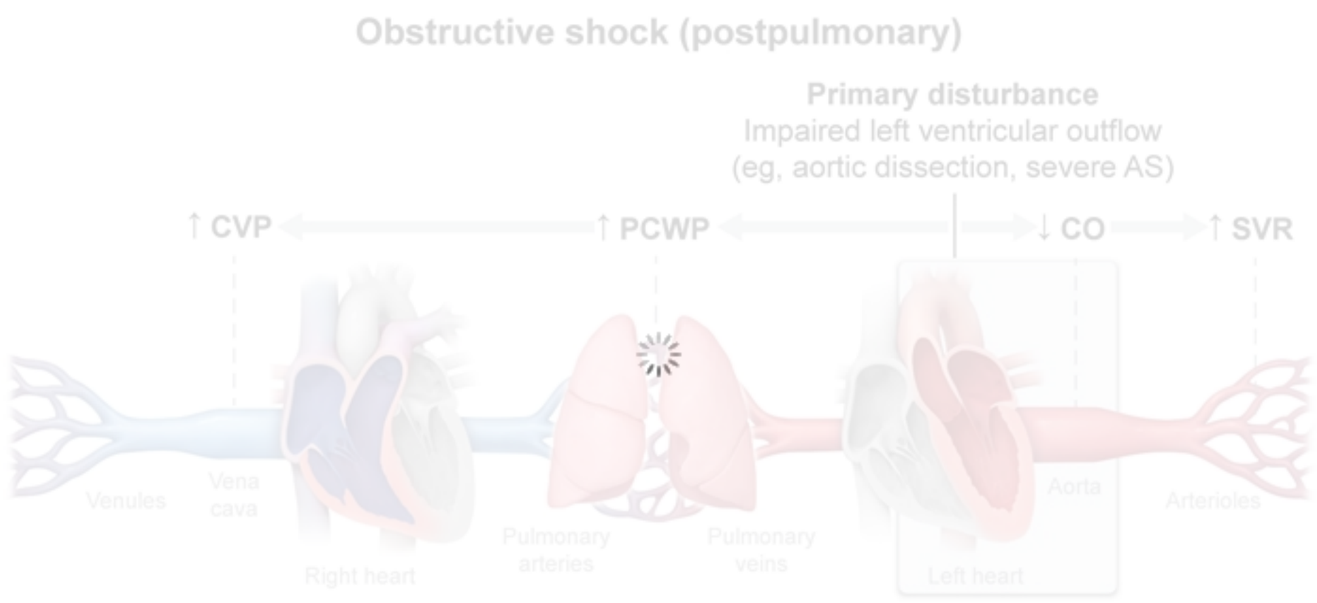
©UWorld

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

Surgery | Pulmonary & Critical Care | Obstructive shock

however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary

Exhibit Display

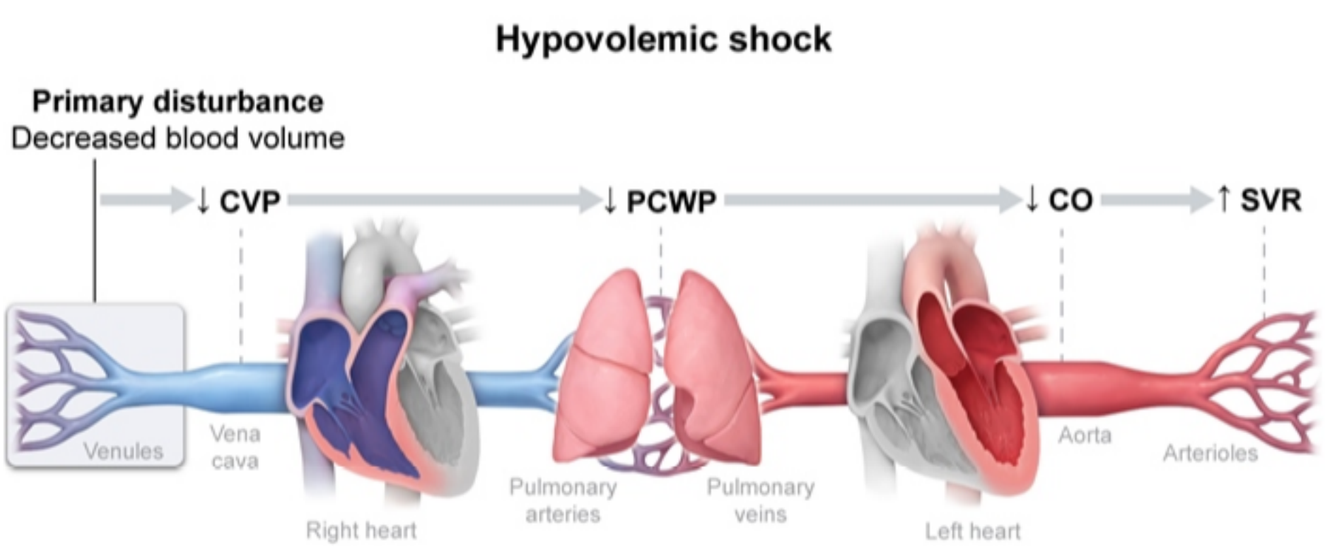


Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

Surgery | Pulmonary & Critical Care | Obstructive shock

however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary

Exhibit Display



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

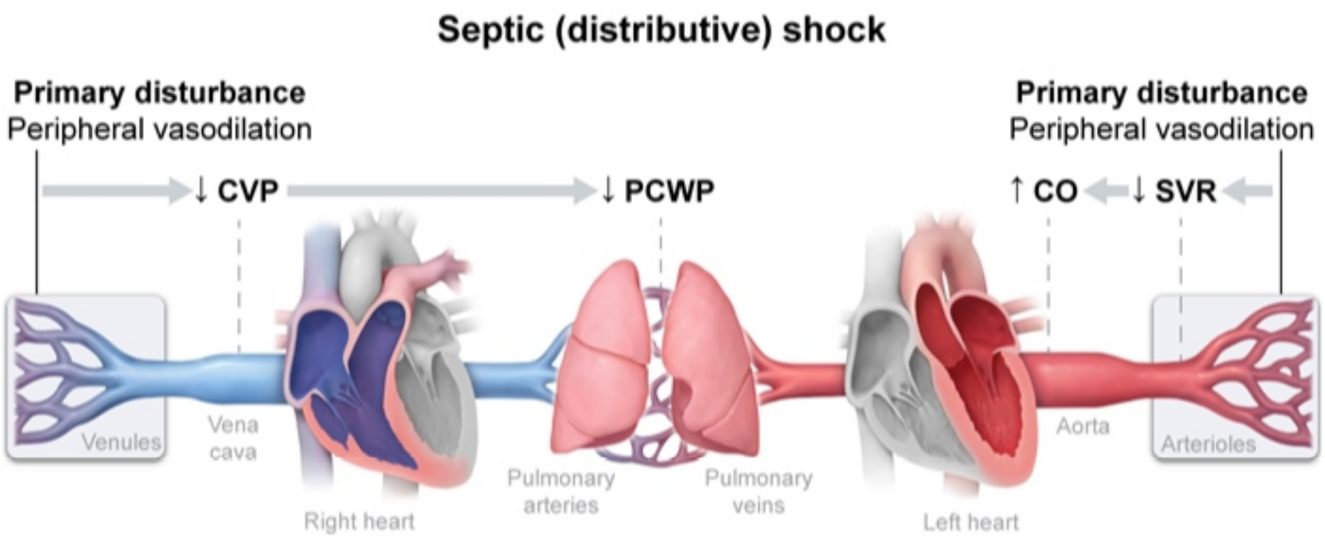
©UWorld

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

Surgery | Pulmonary & Critical Care | Obstructive shock

however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary

Exhibit Display



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

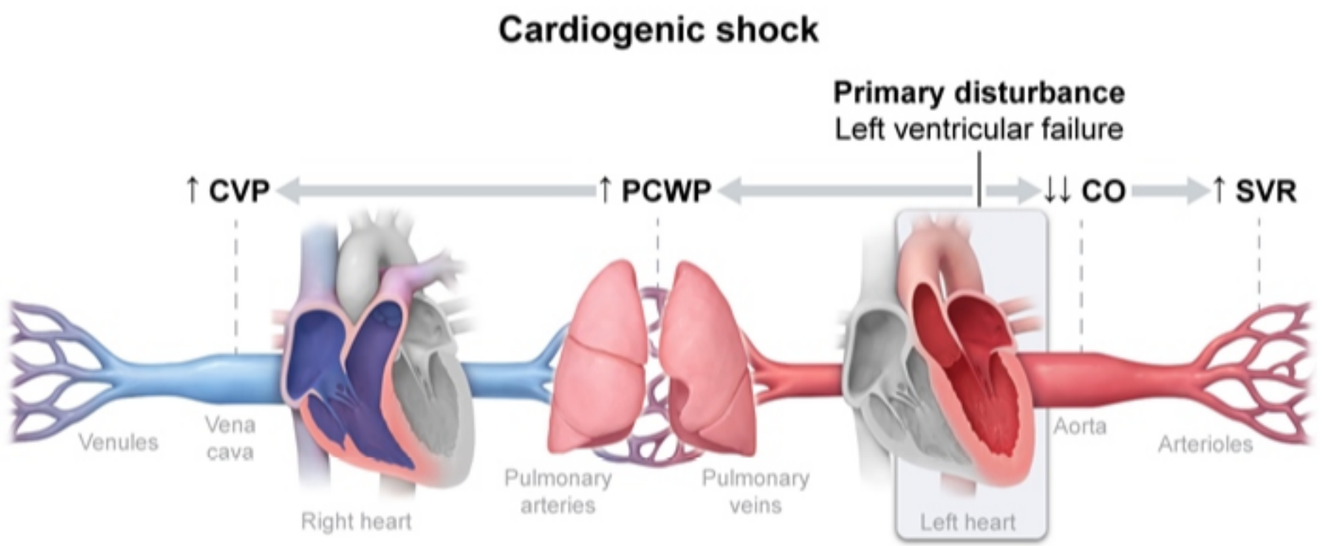
©UWorld

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

Surgery | Pulmonary & Critical Care | Obstructive shock

however, pulmonary capillary wedge pressure (PCWP), an estimate of left atrial pressure and representation of left-sided preload, can vary

Exhibit Display



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

©UWorld

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

Surgery | Pulmonary & Critical Care | Obstructive shock

A 16-year-old boy is brought to the emergency department with abdominal pain. Two hours ago, the patient was playing in a lacrosse match when he suddenly developed severe, persistent pain in his right lower quadrant with associated nausea. He experienced no trauma to the abdomen and has had no fever, vomiting, or diarrhea. The patient has had similar episodes over the past 3 weeks following lacrosse matches, but these episodes resolved shortly afterward with rest. He has no history of groin or scrotal swelling. The patient has no chronic medical conditions and takes no medications. He is sexually active with 1 partner and uses condoms inconsistently. Temperature is 37.7 C (99.9 F). The abdomen is soft, nontender, and nondistended. There is scrotal erythema and edema; the right hemiscrotum is tender to palpation. The pain is worsened when the scrotum is elevated, and the scrotum does not transilluminate. Which of the following is the most likely cause of this patient's symptoms?

- A. Epididymitis
- B. Incarcerated inguinal hernia
- C. Infected hydrocele
- D. Testicular hematoma
- E. Testicular rupture
- F. Testicular torsion

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 16-year-old boy is brought to the emergency department with abdominal pain. Two hours ago, the patient was playing in a lacrosse match when he suddenly developed severe, persistent pain in his right lower quadrant with associated nausea. He experienced no trauma to the abdomen and has had no fever, vomiting, or diarrhea. The patient has had similar episodes over the past 3 weeks following lacrosse matches, but these episodes resolved shortly afterward with rest. He has no history of groin or scrotal swelling. The patient has no chronic medical conditions and takes no medications. He is sexually active with 1 partner and uses condoms inconsistently. Temperature is 37.7 C (99.9 F). The abdomen is soft, nontender, and nondistended. There is scrotal erythema and edema; the right hemiscrotum is tender to palpation. The pain is worsened when the scrotum is elevated, and the scrotum does not transilluminate. Which of the following is the most likely cause of this patient's symptoms?

- A. Epididymitis (16%)
- B. Incarcerated inguinal hernia (15%)
- C. Infected hydrocele (1%)
- D. Testicular hematoma (3%)
- E. Testicular rupture (0%)
- ✓ F. Testicular torsion (63%)

Omitted
Correct answer
F

63%
Answered correctly

02 secs
Time Spent

02/23/2020
Last Updated

Explanation

Testicular torsion	
Epidemiology	• Most common in adolescents
Clinical features	• Testicular, inguinal, abdominal pain • Nausea, vomiting • Horizontal testicular lie with elevated testicle • Absent cremasteric reflex • Swollen, erythematous scrotum
Imaging	• No blood flow on scrotal ultrasound with Doppler
Management	• Surgical detorsion & fixation with exploration of the contralateral side • Manual detorsion (if immediate surgery is not available)

This adolescent male has recurrent abdominal pain and nausea after strenuous physical activity; examination reveals a normal abdomen but a tender, erythematous scrotum. This presentation suggests **testicular torsion**, which occurs due to insufficient fixation of the testis to the tunica vaginalis, allowing testicular hypermobility. **Exercise**, mild trauma, or movement during sleep can induce twisting of the testis about the spermatic cord, leading to obstruction of blood flow and testicular ischemia.

Testicular torsion occurs most commonly in adolescents due to enlargement of the testes during puberty. Classically, patients experience severe, acute-onset **scrotal pain** that does not resolve with elevation of the testicle (negative Prehn sign); however, some patients report inguinal or **lower abdominal pain** as their primary symptom. Nausea and vomiting are common. Prior episodes that resolve without intervention (as in this patient) can indicate **intermittent torsion**.

Physical examination classically reveals a tender, high-riding testicle; a horizontal lie of the testis may be visible. The scrotum is typically erythematous and markedly swollen. The **cremasteric reflex** (stroking the inner thigh causing testicular elevation) is characteristically **absent**. The diagnosis is often made clinically, but a Doppler ultrasound can be used for confirmation. Testicular torsion is a surgical emergency and

This adolescent male has recurrent abdominal pain and nausea after strenuous physical activity; examination reveals a normal abdomen but a tender, erythematous scrotum. This presentation suggests **testicular torsion**, which occurs due to insufficient fixation of the testis to the tunica vaginalis, allowing testicular hypermobility. **Exercise**, mild trauma, or movement during sleep can induce twisting of the testis about the spermatic cord, leading to obstruction of blood flow and testicular ischemia.

Testicular torsion occurs most commonly in adolescents due to enlargement of the testes during puberty. Classically, patients experience severe, acute-onset **scrotal pain** that does not resolve with elevation of the testicle (negative Prehn sign); however, some patients report inguinal or **lower abdominal pain** as their primary symptom. Nausea and vomiting are common. Prior episodes that resolve without intervention (as in this patient) can indicate **intermittent torsion**.

Physical examination classically reveals a tender, high-riding testicle; a horizontal lie of the testis may be visible. The scrotum is typically erythematous and markedly swollen. The **cremasteric reflex** (stroking the inner thigh causing testicular elevation) is characteristically **absent**. The diagnosis is often made clinically, but a Doppler ultrasound can be used for confirmation. Testicular torsion is a surgical emergency and should prompt urgent urologic evaluation for detorsion because loss of testicular viability can occur within a matter of hours.

(Choice A) Acute epididymitis can cause similar symptoms in a sexually active patient; however, pain (which initially affects the posterior testis, where the epididymis is located) is unlikely to occur intermittently and is typically improved with elevation of the testis (positive Prehn sign). Dysuria and urethral discharge may also be present.

(Choice B) Incarcerated inguinal hernia can cause scrotal pain and swelling, but patients typically have a history of a mass that increases with elevated intraabdominal pressure (eg, bearing down). Pain that worsens with testicular elevation makes torsion more likely than inguinal hernia. In addition, an incarcerated hernia would not usually occur intermittently and resolve without intervention.

(Choice C) Infected hydrocele is very rare but could present with lower abdominal or scrotal pain; however, infection would more likely cause progressive pain and fevers as opposed to the intermittent, recurrent symptoms this patient has experienced. In addition, hydroceles transilluminate when light is shined behind the scrotum.

(Choices D and E) Testicular hematoma and testicular rupture can cause significant pain, scrotal swelling, and erythema. However, these typically occur in the setting of significant trauma (eg, baseball to the scrotum), which was not reported in this case.

Educational objective:

abdominal pain as their primary symptom. Nausea and vomiting are common. Prior episodes that resolve without intervention (as in this patient) can indicate **intermittent torsion**.

Physical examination classically reveals a tender, high-riding testicle; a horizontal lie of the testis may be visible. The scrotum is typically erythematous and markedly swollen. The **cremasteric reflex** (stroking the inner thigh causing testicular elevation) is characteristically **absent**. The diagnosis is often made clinically, but a Doppler ultrasound can be used for confirmation. Testicular torsion is a surgical emergency and should prompt urgent urologic evaluation for detorsion because loss of testicular viability can occur within a matter of hours.

(Choice A) Acute epididymitis can cause similar symptoms in a sexually active patient; however, pain (which initially affects the posterior testis, where the epididymis is located) is unlikely to occur intermittently and is typically improved with elevation of the testis (positive Prehn sign). Dysuria and urethral discharge may also be present.

(Choice B) Incarcerated inguinal hernia can cause scrotal pain and swelling, but patients typically have a history of a mass that increases with elevated intraabdominal pressure (eg, bearing down). Pain that worsens with testicular elevation makes torsion more likely than inguinal hernia. In addition, an incarcerated hernia would not usually occur intermittently and resolve without intervention.

(Choice C) Infected hydrocele is very rare but could present with lower abdominal or scrotal pain; however, infection would more likely cause progressive pain and fevers as opposed to the intermittent, recurrent symptoms this patient has experienced. In addition, hydroceles transilluminate when light is shined behind the scrotum.

(Choices D and E) Testicular hematoma and testicular rupture can cause significant pain, scrotal swelling, and erythema. However, these typically occur in the setting of significant trauma (eg, baseball to the scrotum), which was not reported in this case.

Educational objective:
Testicular torsion presents with abrupt onset of scrotal, inguinal, or abdominal pain, which classically does not resolve with elevation of the testicle. Torsion can occur after exercise, and patients may have recurring, transient symptoms due to intermittent torsion.

Surgery	Male Reproductive System	Testicular torsion
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 56-year-old man comes to the office for follow up of hypertension. The patient had undergone kidney transplantation one year ago for focal segmental glomerulosclerosis. He was originally seen in the office 8 weeks ago for hypertension and had a blood pressure of 210/110 mm Hg; initially he was given amlodipine, but the patient continued to have hypertension. Two weeks ago, he was also started on lisinopril. In addition, he takes tacrolimus and low-dose prednisone. The patient currently feels well. Today, blood pressure is 160/90 mm Hg, pulse is 78/min, and respirations are 16/min. Examination shows normal jugular venous pressure, vesicular breath sounds, and normal heart sounds. The transplant site is nontender. Laboratory studies reveal a serum creatinine level of 2.4 mg/dL (2 weeks ago: 1.5 mg/dL). Serum tacrolimus level is within the normal therapeutic range. Which of the following is the most appropriate next step in management of this patient?

A. Kidney biopsy
B. Lisinopril dose increase
C. Prednisone discontinuance
D. Renal vascular imaging
E. Tacrolimus discontinuance

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 56-year-old man comes to the office for follow up of hypertension. The patient had undergone kidney transplantation one year ago for focal segmental glomerulosclerosis. He was originally seen in the office 8 weeks ago for hypertension and had a blood pressure of 210/110 mm Hg; initially he was given amlodipine, but the patient continued to have hypertension. Two weeks ago, he was also started on lisinopril. In addition, he takes tacrolimus and low-dose prednisone. The patient currently feels well. Today, blood pressure is 160/90 mm Hg, pulse is 78/min, and respirations are 16/min. Examination shows normal jugular venous pressure, vesicular breath sounds, and normal heart sounds. The transplant site is nontender. Laboratory studies reveal a serum creatinine level of 2.4 mg/dL (2 weeks ago: 1.5 mg/dL). Serum tacrolimus level is within the normal therapeutic range. Which of the following is the most appropriate next step in management of this patient?

- A. Kidney biopsy (19%)
- B. Lisinopril dose increase (5%)
- C. Prednisone discontinuance (3%)
- ✓ D. Renal vascular imaging (59%)
- E. Tacrolimus discontinuance (11%)

Omitted
Correct answer
D

59%
Answered correctly

01 sec
Time Spent

01/26/2020
Last Updated

Explanation

This patient with a history of renal transplant has severe, persistent hypertension. In association with the acute kidney injury (AKI) that developed after initiation of lisinopril, this presentation suggests **renovascular hypertension** due to **transplant renal artery stenosis** (RAS). Although most cases of RAS occur in elderly men with diffuse atherosclerotic disease, it can also occur in patients with a transplanted kidney and is commonly

Explanation

This patient with a history of renal transplant has severe, persistent hypertension. In association with the acute kidney injury (AKI) that developed after initiation of lisinopril, this presentation suggests **renovascular hypertension** due to **transplant renal artery stenosis** (RAS). Although most cases of RAS occur in elderly men with diffuse atherosclerotic disease, it can also occur in patients with a transplanted kidney and is commonly associated with operative abnormalities (eg, trauma during organ procurement, abnormal suture placement), viral infection (cytomegalovirus, BK virus), and atherosclerosis of the donor artery. Transplant RAS typically occurs in the first 2 years after transplantation.

Similar to RAS due to other causes, transplant RAS typically manifests with **resistant hypertension**. A **decline in renal function** after the addition of **ACE inhibitors** or angiotensin II receptor blockers is highly suggestive of the diagnosis. Other findings that suggest RAS include a lateralizing abdominal bruit and recurrent flash pulmonary edema. The diagnosis is made with **renal vascular imaging** (eg, renal Doppler ultrasonography). Management of transplant RAS usually includes **angioplasty**, possibly with stent placement.

(Choice A) Kidney biopsy is indicated to evaluate for AKI due to acute allograft rejection, which is somewhat less likely in the absence of graft tenderness or fever. In addition, biopsy is invasive, and noninvasive methods of assessment (eg, imaging) should be performed prior to biopsy.

(Choice B) Because transplant RAS is the equivalent of bilateral RAS in a non-transplant patient, the initiation of an ACE inhibitor is likely to trigger AKI. Increased lisinopril dosing would likely further worsen this patient's renal function.

(Choices C and E) High-dose prednisone is a common cause of hypertension; however, low doses are not typically associated with marked hypertension. Toxicity to calcineurin inhibitors (eg, tacrolimus) can cause hypertension and AKI; however, such adverse effects are more common with elevated plasma drug levels. In addition, the timing of this patient's AKI following initiation of lisinopril makes RAS more likely than an adverse effect of immunosuppression.

Educational objective:
Renal artery stenosis (RAS) can occur in the renal allograft, typically within 2 years of transplant. Like other forms of RAS, suggestive findings include persistently elevated blood pressure, decline in renal function with the addition of ACE inhibitors, a lateralizing abdominal bruit, and recurrent flash pulmonary edema. The diagnosis is made with renal vascular imaging (eg, renal Doppler ultrasonography).

after initiation of lisinopril, this presentation suggests **renovascular hypertension** due to **transplant renal artery stenosis** (RAS). Although most cases of RAS occur in elderly men with diffuse atherosclerotic disease, it can also occur in patients with a transplanted kidney and is commonly associated with operative abnormalities (eg, trauma during organ procurement, abnormal suture placement), viral infection (cytomegalovirus, BK virus), and atherosclerosis of the donor artery. Transplant RAS typically occurs in the first 2 years after transplantation.

Similar to RAS due to other causes, transplant RAS typically manifests with **resistant hypertension**. A **decline in renal function** after the addition of **ACE inhibitors** or angiotensin II receptor blockers is highly suggestive of the diagnosis. Other findings that suggest RAS include a lateralizing abdominal bruit and recurrent flash pulmonary edema. The diagnosis is made with **renal vascular imaging** (eg, renal Doppler ultrasonography). Management of transplant RAS usually includes **angioplasty**, possibly with stent placement.

(Choice A) Kidney biopsy is indicated to evaluate for AKI due to acute allograft rejection, which is somewhat less likely in the absence of graft tenderness or fever. In addition, biopsy is invasive, and noninvasive methods of assessment (eg, imaging) should be performed prior to biopsy.

(Choice B) Because transplant RAS is the equivalent of bilateral RAS in a non-transplant patient, the initiation of an ACE inhibitor is likely to trigger AKI. Increased lisinopril dosing would likely further worsen this patient's renal function.

(Choices C and E) High-dose prednisone is a common cause of hypertension; however, low doses are not typically associated with marked hypertension. Toxicity to calcineurin inhibitors (eg, tacrolimus) can cause hypertension and AKI; however, such adverse effects are more common with elevated plasma drug levels. In addition, the timing of this patient's AKI following initiation of lisinopril makes RAS more likely than an adverse effect of immunosuppression.

Educational objective:
Renal artery stenosis (RAS) can occur in the renal allograft, typically within 2 years of transplant. Like other forms of RAS, suggestive findings include persistently elevated blood pressure, decline in renal function with the addition of ACE inhibitors, a lateralizing abdominal bruit, and recurrent flash pulmonary edema. The diagnosis is made with renal vascular imaging (eg, renal Doppler ultrasonography).

Surgery	Renal, Urinary Systems & Electrolytes	Renal artery stenosis
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 62-year-old man comes to the office for a follow-up visit a week after undergoing percutaneous coronary intervention. In the past 2 months, he has had several episodes of retrosternal chest pain, and a myocardial perfusion scan revealed an area of reversible ischemia on the lateral wall. Coronary angiography was performed through a right femoral access, and a drug-eluting stent was placed in the left circumflex artery. The patient has had some discomfort in the right groin since the procedure. He has had no further episodes of chest pain or dyspnea. Other medical issues include hypertension and hyperlipidemia. The patient has smoked a pack of cigarettes daily for 35 years and stopped smoking after he was diagnosed with heart disease. Temperature is 37.1 C (98.8 F), blood pressure is 130/70 mm Hg, and pulse is 86/min. Heart sounds and lung auscultation are normal. There is mild swelling in the right inguinal area with a palpable thrill and a continuous murmur on auscultation. Lower extremity deep tendon reflexes are normal. Which of the following is the most likely cause of this patient's current findings?

A. Abnormal arteriovenous communication
B. Arterial pseudoaneurysm formation
C. Atherosclerotic arterial occlusion
D. Bleeding into the retroperitoneum
E. Iatrogenic peripheral nerve injury
F. Separation of arterial wall layers
G. Thrombotic deep venous occlusion

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 62-year-old man comes to the office for a follow-up visit a week after undergoing percutaneous coronary intervention. In the past 2 months, he has had several episodes of retrosternal chest pain, and a myocardial perfusion scan revealed an area of reversible ischemia on the lateral wall. Coronary angiography was performed through a right femoral access, and a drug-eluting stent was placed in the left circumflex artery. The patient has had some discomfort in the right groin since the procedure. He has had no further episodes of chest pain or dyspnea. Other medical issues include hypertension and hyperlipidemia. The patient has smoked a pack of cigarettes daily for 35 years and stopped smoking after he was diagnosed with heart disease. Temperature is 37.1 C (98.8 F), blood pressure is 130/70 mm Hg, and pulse is 86/min. Heart sounds and lung auscultation are normal. There is mild swelling in the right inguinal area with a palpable thrill and a continuous murmur on auscultation. Lower extremity deep tendon reflexes are normal. Which of the following is the most likely cause of this patient's current findings?

- ✓ A. Abnormal arteriovenous communication (56%)
- B. Arterial pseudoaneurysm formation (30%)
- C. Atherosclerotic arterial occlusion (4%)
- D. Bleeding into the retroperitoneum (2%)
- E. Iatrogenic peripheral nerve injury (0%)
- F. Separation of arterial wall layers (4%)
- G. Thrombotic deep venous occlusion (1%)

Omitted
Correct answer
A

56%
Answered correctly

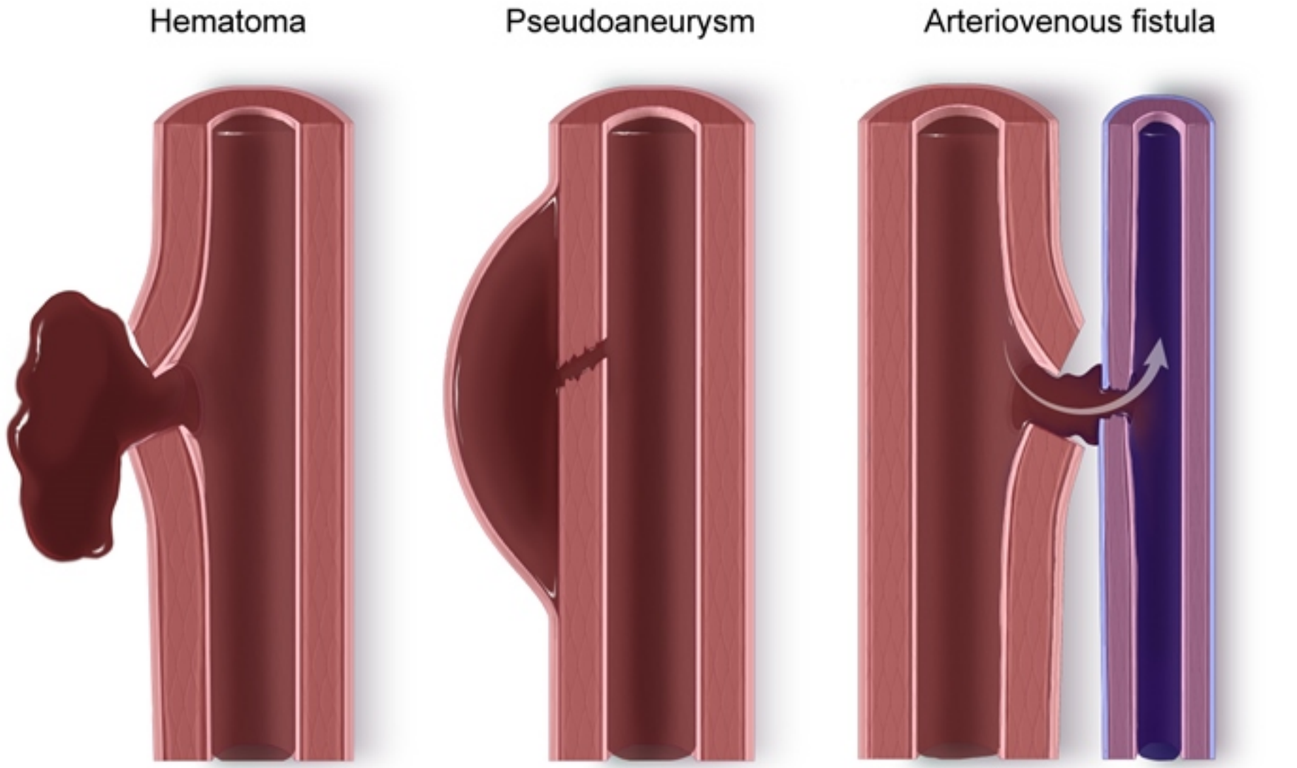
02 secs
Time Spent

01/25/2020
Last Updated

Explanation

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Local vascular complications of cardiac catheterization



The femoral artery is the most common vascular access point in patients undergoing **cardiac catheterization**. A number of local complications can occur; this patient has likely developed an **arteriovenous fistula (AVF)**. The femoral **vein can be inadvertently punctured** during needle

The femoral artery is the most common vascular access point in patients undergoing **cardiac catheterization**. A number of local complications can occur; this patient has likely developed an **arteriovenous fistula (AVF)**. The femoral **vein can be inadvertently punctured** during needle insertion attempts to obtain femoral arterial access. Following the procedure, inadequate hemostasis may allow persistent **bleeding from the arterial puncture site** to **track into the venous puncture site**, creating an AVF.

Most patients are initially asymptomatic but gradually develop mild swelling and localized tenderness. As arterial pressure exceeds venous pressure throughout the cardiac cycle, a **continuous bruit** with a **palpable thrill** is typically present. In addition, distal pulses may be diminished in the affected extremity. An untreated AVF can progressively enlarge and lead to limb edema (due to venous hypertension), limb ischemia (due to redirection of arterial blood flow), and high-output heart failure (due to blood returning to the right atrium without passing through peripheral resistance).

The diagnosis is typically confirmed by duplex ultrasound. Management of small AVFs involves observation (sometimes resulting in spontaneous closure) or ultrasound-guided compression. Large AVFs typically require surgical repair.

(Choice B) Femoral artery pseudoaneurysm develops when an inadequately sealed arterial puncture site leads to a hematoma contained within periarterial connective tissue. Ongoing communication with the arterial lumen creates a tender, pulsatile mass with an audible systolic (rather than a continuous) bruit.

(Choices C and G) Atherosclerotic arterial occlusion and deep venous thrombosis are not typical complications of cardiac catheterization, and a continuous bruit with a palpable thrill would not be expected.

(Choice D) A potentially fatal complication of cardiac catheterization is an expanding hematoma with extension into the retroperitoneum. Patients typically have flank pain and hypotension within 24 hours of the procedure.

(Choice E) Iatrogenic peripheral nerve injury can occur during vascular access due to close proximity of the femoral artery and femoral nerve. Discomfort or paresthesias in the ipsilateral thigh accompanied by patellar tendon hyporeflexia would be expected.

(Choice F) Femoral artery dissection (separation of arterial wall layers) can occur following vascular access. Patients may be asymptomatic or develop symptoms of acute lower extremity ischemia (eg, pain, pallor). However, a bruit or thrill is not typical.

Educational objective:
An arteriovenous fistula can develop as a complication of vascular access during cardiac catheterization. Patients typically have mild localized

resistance).

The diagnosis is typically confirmed by duplex ultrasound. Management of small AVFs involves observation (sometimes resulting in spontaneous closure) or ultrasound-guided compression. Large AVFs typically require surgical repair.

(Choice B) Femoral artery pseudoaneurysm develops when an inadequately sealed arterial puncture site leads to a hematoma contained within periarterial connective tissue. Ongoing communication with the arterial lumen creates a tender, pulsatile mass with an audible systolic (rather than a continuous) bruit.

(Choices C and G) Atherosclerotic arterial occlusion and deep venous thrombosis are not typical complications of cardiac catheterization, and a continuous bruit with a palpable thrill would not be expected.

(Choice D) A potentially fatal complication of cardiac catheterization is an expanding hematoma with extension into the retroperitoneum. Patients typically have flank pain and hypotension within 24 hours of the procedure.

(Choice E) Iatrogenic peripheral nerve injury can occur during vascular access due to close proximity of the femoral artery and femoral nerve. Discomfort or paresthesias in the ipsilateral thigh accompanied by patellar tendon hyporeflexia would be expected.

(Choice F) Femoral artery dissection (separation of arterial wall layers) can occur following vascular access. Patients may be asymptomatic or develop symptoms of acute lower extremity ischemia (eg, pain, pallor). However, a bruit or thrill is not typical.

Educational objective:
An arteriovenous fistula can develop as a complication of vascular access during cardiac catheterization. Patients typically have mild localized pain and swelling and a continuous bruit accompanied by a palpable thrill over the fistula site.

References

- Access site complications following cardiac catheterization assessed by duplex ultrasonography.

Surgery	Cardiovascular System	Av fistula
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

An 18-year-old woman is brought to the emergency department with severe vomiting, diarrhea, and dizziness that started this morning. Three days ago, she had nasal bleeding that required anterior packing in the emergency department. Yesterday, she had pain and a sensation of pressure under her left eye and scant blood-tinged nasal discharge. The pain was relieved by acetaminophen and ibuprofen. The patient, who has no sick contacts, has a history of asthma and allergic rhinitis. Her last menstrual period was 3 weeks ago. She does not use tobacco, alcohol, or illicit drugs. Her temperature is 38.9° C (102.2° F), blood pressure is 90/60 mm Hg supine and 66/45 mm Hg standing, pulse is 120/min, and respirations are 23/min. She appears alert but restless. On examination, there are diffuse, confluent erythematous macules on her trunk and extremities. The oropharynx appears hyperemic.

Laboratory results are as follows:

Platelets	55,000/μL
Leukocytes	9,500 cells/μL
Bands	30%

Which of the following is the most likely diagnosis?

A. Meningococcemia
B. Rocky Mountain spotted fever
C. Scarlet fever
D. Stevens-Johnson syndrome
E. Toxic shock syndrome

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Which of the following is the most likely diagnosis?

- A. Meningococcemia (21%)
- B. Rocky Mountain spotted fever (5%)
- C. Scarlet fever (5%)
- D. Stevens-Johnson syndrome (3%)
- ✓ E. Toxic shock syndrome (62%)

Omitted
Correct answer
E

62%
Answered correctly

02 secs
Time Spent

02/26/2020
Last Updated

Explanation

Clinical features of toxic shock syndrome

- Fever usually >38.9 C (102 F)
- Hypotension with systolic BP ≤90 mm Hg
- Diffuse macular erythroderma
- Skin desquamation, including palms & soles, 1-2 weeks after illness onset
- Multisystem involvement (3 or more systems)
  - Gastrointestinal (vomiting &/or diarrhea)
  - Muscular (severe myalgias or elevated creatine kinase)
  - Mucous membrane hyperemia

Clinical features of toxic shock syndrome
• Fever usually >38.9 C (102 F) • Hypotension with systolic BP ≤90 mm Hg • Diffuse macular erythroderma • Skin desquamation, including palms & soles, 1-2 weeks after illness onset • Multisystem involvement (3 or more systems)   ◦ Gastrointestinal (vomiting &/or diarrhea)   ◦ Muscular (severe myalgias or elevated creatine kinase)   ◦ Mucous membrane hyperemia   ◦ Renal (BUN or serum creatinine >1-2x upper limit of normal)   ◦ Hematologic (platelets <100,000/mm^3)   ◦ Liver (ALT, AST & total bilirubin >2x upper limit of normal)   ◦ Central nervous system (altered mentation without focal neurological signs)

ALT = alanine aminotransferase; **AST** = aspartate transaminase; **BP** = blood pressure; **BUN** = blood urea nitrogen.

This patient's clinical presentation (recent nasal packing followed by rapid onset of rash, fever, hypotension, diarrhea, and thrombocytopenia) is consistent with toxic shock syndrome (TSS) due to *Staphylococcus aureus*. TSS is caused by toxic shock syndrome toxin-1, which acts as a superantigen and causes T cell activation and release of large amounts of cytokines. Approximately 50% of TSS cases are related to menstruation (tampon use); the remainder are nonmenstrual (eg, surgical wound infections, sinusitis, septorhinoplasty).

The clinical symptoms and signs of TSS develop rapidly, and the median interval after onset of menstruation (or infections) is 2-3 days. Signs and symptoms include fever, diffuse myalgias, vomiting, profuse diarrhea, hypotension, and a diffuse macular erythroderma similar to sunburn. Leukocytosis may not be present, but immature neutrophils are elevated. Thrombocytopenia is common instead. Management includes supportive therapy (eg, intravenous fluids), removal of foreign materials from surgery, and broad-spectrum anti-staphylococcal antibiotics.

(Choice A) Skin findings in acute meningococcemia include a petechial rash that progresses to ecchymosis, bullae, vesicles, and, ultimately,

This patient's clinical presentation (recent nasal packing followed by rapid onset of rash, fever, hypotension, diarrhea, and thrombocytopenia) is consistent with toxic shock syndrome (TSS) due to *Staphylococcus aureus*. TSS is caused by toxic shock syndrome toxin-1, which acts as a superantigen and causes T cell activation and release of large amounts of cytokines. Approximately 50% of TSS cases are related to menstruation (tampon use); the remainder are nonmenstrual (eg, surgical wound infections, sinusitis, septorhinoplasty).

The clinical symptoms and signs of TSS develop rapidly, and the median interval after onset of menstruation (or infections) is 2-3 days. Signs and symptoms include fever, diffuse myalgias, vomiting, profuse diarrhea, hypotension, and a diffuse macular erythroderma similar to sunburn. Leukocytosis may not be present, but immature neutrophils are elevated. Thrombocytopenia is common instead. Management includes supportive therapy (eg, intravenous fluids), removal of foreign materials from surgery, and broad-spectrum anti-staphylococcal antibiotics.

(Choice A) Skin findings in acute meningococcemia include a petechial rash that progresses to ecchymosis, bullae, vesicles, and, ultimately, gangrenous necrosis. Patients also usually present with fever, nausea, vomiting, severe myalgias, meningeal signs, and shock.

(Choice B) The rash associated with Rocky Mountain spotted fever is typically petechial, starts in the extremities, and usually occurs a few days after fever onset. This patient's recent nasal packing makes TSS much more likely.

(Choice C) Scarlet fever is primarily a disease of children. Typically, a group A streptococcal infection occurs earlier at another site (eg, tonsillitis, pharyngitis). Skin findings are typically preceded by a prodrome of fever, headache, vomiting, and sore throat. Twelve to 48 hours later, fine pink blanching papules appear on the neck and upper trunk and quickly generalize with flexural accentuation (rough, sandpaper-like texture).

(Choice D) Stevens-Johnson syndrome is a severe skin reaction to certain medications and is occasionally due to infections in children. It is characterized by a prodrome of fever and influenza-like symptoms, followed by the development of mucocutaneous erythematous and purpuric macules that progress to necrosis and sloughing of the epidermis. This patient's overall presentation is more consistent with TSS (eg, nasal packing, nasal discharge, marked hypotension).

Educational objective:
Toxic shock syndrome due to *Staphylococcus aureus* is associated with menstruation (tampons), nasal packing, and post-surgery infections. Patients usually develop fever, myalgias, marked hypotension, and diffuse erythematous macular rash (erythroderma) that can progress to multiorgan involvement.

References

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

An 18-year-old man is brought to the emergency department after falling and striking his chest. He had been playing an interactive video game when he lost his balance and hit his left chest against the coffee table. The patient now has moderate left-sided chest pain, worse with deep inspiration. He also feels lightheaded. On examination, the patient appears uncomfortable and is taking shallow breaths. Blood pressure is 88/50 mm Hg, pulse is 122/min, and respirations are 28/min. Jugular veins are flat. The trachea is midline. The left chest wall has intact, bruised skin and is exquisitely tender to palpation. Breath sounds are present on the right but diminished in the left lung base, which is dull to percussion. Heart sounds are normal without murmurs. The abdomen is soft, nondistended, and nontender. Which of the following is the most likely cause of this patient's condition?

A. Ascending aortic tear
B. Bronchial rupture
C. Intercostal vessel injury
D. Left hemidiaphragm rupture
E. Left phrenic nerve injury

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

An 18-year-old man is brought to the emergency department after falling and striking his chest. He had been playing an interactive video game when he lost his balance and hit his left chest against the coffee table. The patient now has moderate left-sided chest pain, worse with deep inspiration. He also feels lightheaded. On examination, the patient appears uncomfortable and is taking shallow breaths. Blood pressure is 88/50 mm Hg, pulse is 122/min, and respirations are 28/min. Jugular veins are flat. The trachea is midline. The left chest wall has intact, bruised skin and is exquisitely tender to palpation. Breath sounds are present on the right but diminished in the left lung base, which is dull to percussion. Heart sounds are normal without murmurs. The abdomen is soft, nondistended, and nontender. Which of the following is the most likely cause of this patient's condition?

A. Ascending aortic tear
B. Bronchial rupture
C. Intercostal vessel injury
D. Left hemidiaphragm rupture
E. Left phrenic nerve injury

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

An 18-year-old man is brought to the emergency department after falling and striking his chest. He had been playing an interactive video game when he lost his balance and hit his left chest against the coffee table. The patient now has moderate left-sided chest pain, worse with deep inspiration. He also feels lightheaded. On examination, the patient appears uncomfortable and is taking shallow breaths. Blood pressure is 88/50 mm Hg, pulse is 122/min, and respirations are 28/min. Jugular veins are flat. The trachea is midline. The left chest wall has intact, bruised skin and is exquisitely tender to palpation. Breath sounds are present on the right but diminished in the left lung base, which is dull to percussion. Heart sounds are normal without murmurs. The abdomen is soft, nondistended, and nontender. Which of the following is the most likely cause of this patient's condition?

- A. Ascending aortic tear (15%)
- B. Bronchial rupture (8%)
- ✓ C. Intercostal vessel injury (57%)
- D. Left hemidiaphragm rupture (16%)
- E. Left phrenic nerve injury (1%)

Omitted
Correct answer
C

57%
Answered correctly

04 secs
Time Spent

06/07/2020
Last Updated

Explanation

This patient with isolated **blunt chest trauma** (eg, blow to the chest on the table) now has symptomatic hypotension (lightheadedness), tachycardia, and flat jugular veins, concerning for **hypovolemic shock**. Because each half of the chest can hold up to 40% of the circulating blood volume, large **intrathoracic hemorrhage** (eg, hemothorax) can lead to acute hemodynamic instability.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Explanation

This patient with isolated **blunt chest trauma** (eg, blow to the chest on the table) now has symptomatic hypotension (lightheadedness), tachycardia, and flat jugular veins, concerning for **hypovolemic shock**. Because each half of the chest can hold up to 40% of the circulating blood volume, large **intrathoracic hemorrhage** (eg, hemothorax) can lead to acute hemodynamic instability.

Hemothorax (eg, diminished breath sounds, dullness to percussion) may result from injuries to large (eg, aorta, hilar vessels) or small intrathoracic structures (eg, intercostal blood vessels, lung parenchyma). Given this patient's pleuritic chest pain and exquisite chest wall tenderness to palpation, the most likely source is **fractured ribs** with **intercostal vessel injury**. Hemothorax is treated with **tube thoracostomy**, which is sufficient to resolve many cases, although if immediate chest tube output is >1,500 mL of blood, emergent surgical thoracotomy is indicated.

(Choice A) Blunt chest trauma can transmit stretching, shearing, and torsional forces capable of tearing the aorta, which (if the tear is full-thickness) may cause massive hemothorax and hemorrhagic shock. However, this typically occurs after a more severe mechanism of rapid deceleration (eg, fall >3 m [10 ft], motor vehicle collision), and the aortic isthmus (rather than the ascending aorta) is the most commonly affected site. Ascending aortic involvement would likely have additional findings such as acute coronary syndrome, cardiac tamponade, or focal neurologic deficits (from cerebrovascular ischemia).

(Choice B) Bronchial rupture causes rapid leakage of air from the tracheobronchial tree into the pleural space and surrounding tissues, which can lead to respiratory distress. However, it classically has associated crepitus and a large pneumothorax, with hyperresonance (rather than dullness) on percussion.

(Choices D and E) Unilateral diaphragmatic dysfunction due to phrenic nerve injury or traumatic diaphragmatic rupture can present with tachypnea, shallow breathing, and unilateral diminished breath sounds (due to decreased lung expansion). However, neither injury typically results in severe hypotension or tachycardia (ie, shock).

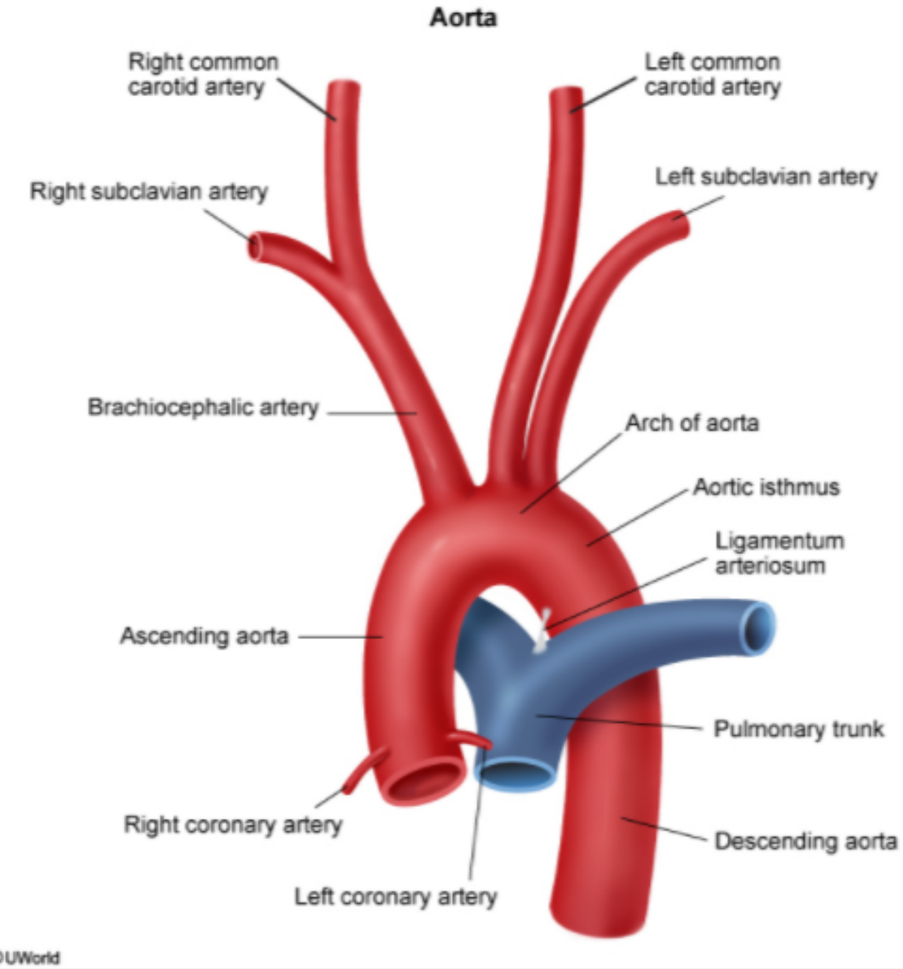
Educational objective:
Hypovolemic shock in the setting of blunt chest trauma is concerning for intrathoracic hemorrhage. Rib fractures (with intercostal vessel injury) are a common cause of hemothorax.

References

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Explanation

Exhibit Display



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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 4-hour-old boy is evaluated in the nursery for routine newborn care. The patient was born at 38 weeks gestation via spontaneous vaginal delivery to an 18-year-old woman who did not receive prenatal care or take prenatal vitamins. Birth weight is 3.6 kg (8 lb). Vital signs are normal. Examination shows a sleeping infant in no distress. There is molding of the occiput. A soft mass inferior to the umbilical stump is 1.4 cm in diameter and covered by skin. The mass increases in size when the infant cries and reduces into the abdominal cavity with gentle pressure. The mass does not seem to be tender to palpation. The rest of the examination is normal. Which of the following is the best next step in management of this patient's mass?

A. Abdominal ultrasound
B. Immediate surgery
C. Karyotype analysis
D. Observation only
E. Topical silver nitrate

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 4-hour-old boy is evaluated in the nursery for routine newborn care. The patient was born at 38 weeks gestation via spontaneous vaginal delivery to an 18-year-old woman who did not receive prenatal care or take prenatal vitamins. Birth weight is 3.6 kg (8 lb). Vital signs are normal. Examination shows a sleeping infant in no distress. There is molding of the occiput. A soft mass inferior to the umbilical stump is 1.4 cm in diameter and covered by skin. The mass increases in size when the infant cries and reduces into the abdominal cavity with gentle pressure. The mass does not seem to be tender to palpation. The rest of the examination is normal. Which of the following is the best next step in management of this patient's mass?

- A. Abdominal ultrasound (12%)
- B. Immediate surgery (4%)
- C. Karyotype analysis (3%)
- ✓ D. Observation only (77%)
- E. Topical silver nitrate (2%)

Omitted
Correct answer
D

77%
Answered correctly

02 secs
Time Spent

03/20/2020
Last Updated

Explanation

Congenital umbilical hernia	
Pathophysiology	• Incomplete closure of abdominal muscles
	• Soft, nontender bulge at umbilicus

Congenital umbilical hernia	
Pathophysiology	• Incomplete closure of abdominal muscles
Clinical features	• Soft, nontender bulge at umbilicus • Protrudes with increased abdominal pressure • Typically reducible
Management	• Observe for spontaneous closure • Elective surgery around age 5

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated with hypothyroidism and Ehlers-Danlos, Beckwith-Wiedemann, and Down syndromes, but also occurs frequently in normal newborns. Physical examination shows a **soft**, nontender **bulge** covered by skin that protrudes with increased abdominal pressure (eg, crying, straining). The hernia may contain omentum or portions of the small intestine. Most umbilical hernias are **reduced** easily through the umbilical ring with very low risk of incarceration and strangulation.

Small umbilical hernias typically **close spontaneously** as the rectus abdominis muscles grow together and fascial layers fuse. Spontaneous closure is less likely with large (>1.5 cm diameter) hernias or in patients with underlying medical problems. Surgery is recommended around **age 5** for persistent hernias, or sooner if complications occur.

(Choice A) Abdominal ultrasound is often performed in an older child or adult when an acquired umbilical hernia is suspected. This patient has a congenital hernia, which is diagnosed clinically.

(Choice B) Immediate surgery is performed for gastroschisis, an intestinal protrusion lateral to the umbilicus, and omphalocele, a covered protrusion of abdominal contents. However, it is not indicated for an uncomplicated umbilical hernia.

(Choice C) Karyotype analysis evaluates for Down syndrome in a patient with characteristic features (eg, single palmar crease, hypotonia, sandal gap deformity, upslanting palpebral fissures, epicanthal folds). Although more common in patients with Down syndrome, an umbilical hernia alone does not warrant further workup.

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated with hypothyroidism and Ehlers-Danlos, Beckwith-Wiedemann, and Down syndromes, but also occurs frequently in normal newborns. Physical examination shows a **soft**, nontender **bulge** covered by skin that protrudes with increased abdominal pressure (eg, crying, straining). The hernia may contain omentum or portions of the small intestine. Most umbilical hernias are **reduced** easily through the umbilical ring with very low risk of incarceration and strangulation.

Small umbilical hernias typically **close spontaneously** as the rectus abdominis muscles grow together and fascial layers fuse. Spontaneous closure is less likely with large (>1.5 cm diameter) hernias or in patients with underlying medical problems. Surgery is recommended around **age 5** for persistent hernias, or sooner if complications occur.

(Choice A) Abdominal ultrasound is often performed in an older child or adult when an acquired umbilical hernia is suspected. This patient has a congenital hernia, which is diagnosed clinically.

(Choice B) Immediate surgery is performed for gastroschisis, an intestinal protrusion lateral to the umbilicus, and omphalocele, a covered protrusion of abdominal contents. However, it is not indicated for an uncomplicated umbilical hernia.

(Choice C) Karyotype analysis evaluates for Down syndrome in a patient with characteristic features (eg, single palmar crease, hypotonia, sandal gap deformity, upslanting palpebral fissures, epicanthal folds). Although more common in patients with Down syndrome, an umbilical hernia alone does not warrant further workup.

(Choice E) An umbilical granuloma presents in newborns after the umbilical cord has separated with a moist, red, pedunculated, friable umbilical mass. Treatment is with silver nitrate.

Educational objective:
A congenital umbilical hernia is typically soft and reducible and does not require intervention. These hernias usually close spontaneously by age 5.

References

- Low risk, but not no risk, of umbilical hernia complications requiring acute surgery in childhood.
- Profile of paediatric umbilical hernias managed at Federal Medical Centre Umuahia.

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated with hypothyroidism and Ehlers-Danlos, Beckwith-Wiedemann, and Down syndromes, but also occurs frequently in normal newborns. Physical examination shows a **soft** ...nia may contain omentum or ... of incarceration and strangul...

Small umbilical hernias ty... closure is less likely with l... **5** for persistent hernias, o...

(Choice A) Abdominal ul... congenital hernia, which is...

(Choice B) Immediate su... protrusion of abdominal c...

(Choice C) Karyotype an... gap deformity, upslanting ... does not warrant further w...

(Choice E) An umbilical g... mass. Treatment is with s...

Educational objective:
A congenital umbilical her... 5.

References

- Low risk, but not no ris...
- Profile of paediatric umbilical hernias managed at Federal Medical Centre Umuahia.

Exhibit Display



0:00 / 0:03

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated with hypothyroidism and Ehlers-Danlos, Beckwith-Wiedemann, and Down syndromes, but also occurs frequently in normal newborns. Physical examination shows a **soft** ...nia may contain omentum or ... of incarceration and strangul...

Small umbilical hernias ty... closure is less likely with l... **5** for persistent hernias, o...

(Choice A) Abdominal ul... congenital hernia, which is...

(Choice B) Immediate su... protrusion of abdominal c...

(Choice C) Karyotype an... gap deformity, upslanting ... does not warrant further w...

(Choice E) An umbilical g... mass. Treatment is with s...

Educational objective:
A congenital umbilical her... 5.

References

- Low risk, but not no ris...
- Profile of paediatric umbilical hernias managed at Federal Medical Centre Umuahia.

Exhibit Display

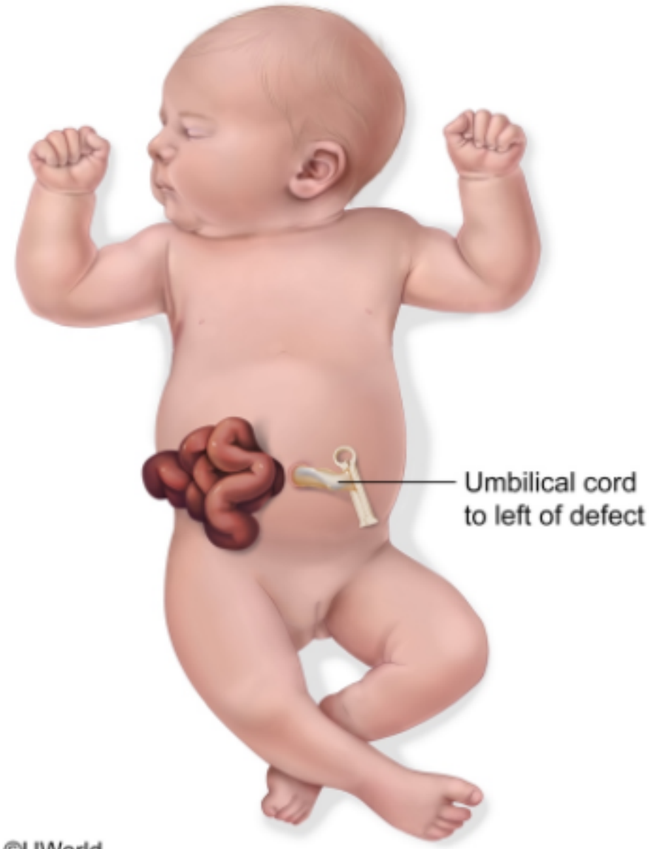


0:00 / 0:09

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated

Exhibit Display

Gastroschisis
Eviscerated bowel with no covering membrane

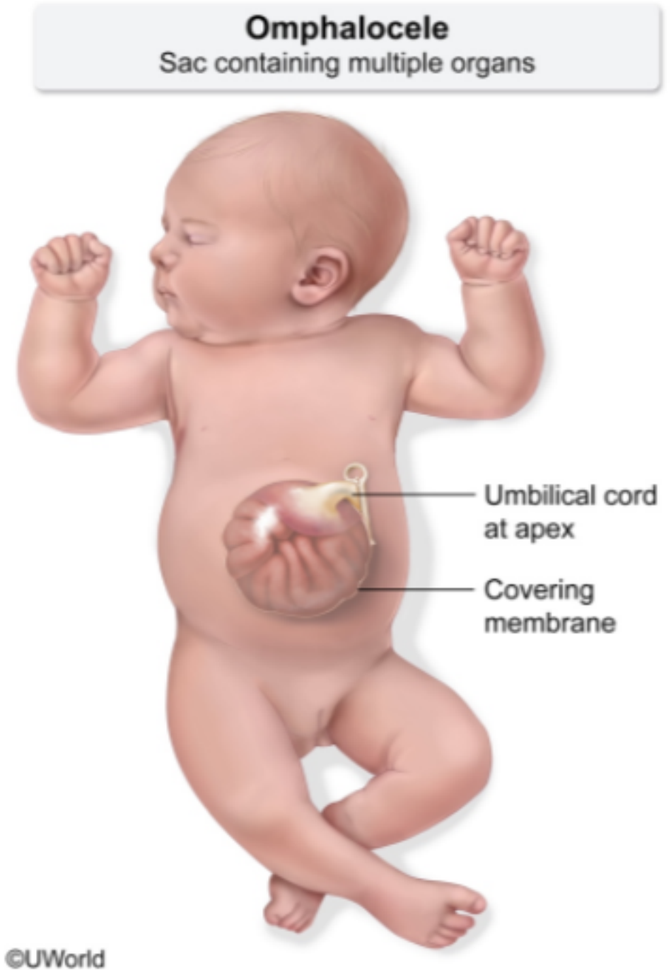


Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A congenital **umbilical hernia** is due to incomplete closure of the abdominal muscles around the umbilical ring at birth. It is commonly associated

Exhibit Display



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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 43-year-old woman comes to the emergency department due to nausea, dizziness, and headache for a day. Her menses began 2 days ago. She has occasionally had fatigue and dizziness during her menstrual periods, but today's symptoms feel different. The patient has a history of von Willebrand disease, causing recurrent, heavy menstrual blood loss, and is scheduled for an endometrial ablation procedure. Her only medication is intranasal desmopressin taken on the first 3 days of her menstrual period. Temperature is 36.9 C (98.4 F), blood pressure is 120/80 mm Hg, pulse is 92/min and regular, and respirations are 18/min. The patient appears restless. Mucous membranes are moist. Deep tendon reflexes are 2+ throughout and Babinski sign is absent. Sensory examination shows no focal deficits. The chest is clear to auscultation. The abdomen is soft and nontender. There is no peripheral edema. The remainder of the examination is unremarkable. Which of the following is the most appropriate next step in management?

A. Arterial blood gas
B. Liver function studies
C. MRI of the brain
D. Plasma desmopressin level
E. Serum electrolytes

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 43-year-old woman comes to the emergency department due to nausea, dizziness, and headache for a day. Her menses began 2 days ago. She has occasionally had fatigue and dizziness during her menstrual periods, but today's symptoms feel different. The patient has a history of von Willebrand disease, causing recurrent, heavy menstrual blood loss, and is scheduled for an endometrial ablation procedure. Her only medication is intranasal desmopressin taken on the first 3 days of her menstrual period. Temperature is 36.9 C (98.4 F), blood pressure is 120/80 mm Hg, pulse is 92/min and regular, and respirations are 18/min. The patient appears restless. Mucous membranes are moist. Deep tendon reflexes are 2+ throughout and Babinski sign is absent. Sensory examination shows no focal deficits. The chest is clear to auscultation. The abdomen is soft and nontender. There is no peripheral edema. The remainder of the examination is unremarkable. Which of the following is the most appropriate next step in management?

- A. Arterial blood gas (3%)
- B. Liver function studies (1%)
- C. MRI of the brain (6%)
- D. Plasma desmopressin level (20%)
- ✓ E. Serum electrolytes (67%)

Omitted
Correct answer
E

67%
Answered correctly

02 secs
Time Spent

03/04/2020
Last Updated

Explanation

Syndrome of inappropriate antidiuretic hormone	

Syndrome of inappropriate antidiuretic hormone	
Etiologies	• CNS disturbance (eg, stroke, hemorrhage, trauma) • Medications (eg, carbamazepine, SSRIs, NSAIDs) • Lung disease (eg, pneumonia) • Ectopic ADH secretion (eg, small cell lung cancer) • Pain &/or nausea
Clinical features	• Mild/moderate hyponatremia: nausea, forgetfulness • Severe hyponatremia: seizures, coma • Euvolemia (eg, moist mucous membranes, no edema, no JVD)
Laboratory findings	• Hyponatremia • Serum osmolality <275 mOsm/kg H_2O (hypotonic) • Urine osmolality >100 mOsm/kg H_2O • Urine sodium >40 mEq/L
Management	• Fluid restriction ± salt tablets • Hypertonic (3%) saline for severe hyponatremia

ADH = antidiuretic hormone; **JVD** = jugular venous distension; **NSAIDs** = nonsteroidal anti-inflammatory drugs; **SSRIs** = selective serotonin reuptake inhibitors.

This patient's acute nausea is likely due to **hyponatremia** induced by recent use of intranasal **desmopressin**. Desmopressin is an analogue of **antidiuretic hormone** (ADH) commonly used to treat central diabetes insipidus; it also promotes the release of von Willebrand factor, and can treat mild to moderately heavy menstrual bleeding associated with von Willebrand disease. However, since desmopressin induces physiologic effects of ADH (eg, renal water reabsorption, concentration of urine), it can cause hyponatremia and excess ADH stimulation, manifesting as **syndrome of inappropriate ADH secretion (SIADH)**. Therefore**, serum electrolytes** should be obtained first in this patient to check for hyponatremia and rule in the diagnosis of SIADH.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

This patient's acute nausea is likely due to **hyponatremia** induced by recent use of intranasal **desmopressin**. Desmopressin is an analogue of **antidiuretic hormone** (ADH) commonly used to treat central diabetes insipidus; it also promotes the release of von Willebrand factor, and can treat mild to moderately heavy menstrual bleeding associated with von Willebrand disease. However, since desmopressin induces physiologic effects of ADH (eg, renal water reabsorption, concentration of urine), it can cause hyponatremia and excess ADH stimulation, manifesting as **syndrome of inappropriate ADH secretion (SIADH)**. Therefore**, serum electrolytes** should be obtained first in this patient to check for hyponatremia and rule in the diagnosis of SIADH.

Expected laboratory findings in patients with SIADH include **hypotonic hyponatremia** (due to ADH-mediated water retention and reabsorption), **high urine osmolality** (ie, concentrated urine), and **high urine sodium** (due to increased secretion of natriuretic peptides). As seen in this patient, SIADH is also associated with **euvolemia** (eg, absence of edema or jugular venous distension) on physical examination. At first, ADH-mediated water reabsorption slightly increases extracellular volume; however, increased natriuretic peptide secretion leads to sodium and water excretion, ultimately normalizing extracellular volume.

(Choice A) Although hypoxemia (eg, from pulmonary embolism) may manifest with nausea, elevated heart rate, and dizziness, this patient has no risk factors for pulmonary disease or symptoms of respiratory distress (eg, shortness of breath, chest pain). Therefore, serum electrolytes are a better initial test.

(Choice B) Although acute liver failure may cause excessive bleeding and present with nausea and dizziness, this patient lacks associated findings of jaundice and abdominal pain and has no risk factors (eg, infection, excess alcohol intake).

(Choice C) MRI of the brain can be used to assess for CNS pathology (eg, bleeding, acute stroke) that could manifest with headache or dizziness. However, this patient lacks focal neurologic signs; therefore, a metabolic workup with serum electrolytes is a more appropriate initial test.

(Choice D) Plasma desmopressin is not routinely measured. It may be high in this patient, given her recent medication use with the onset of menses, but serum electrolytes are a more rapid initial step for confirming hyponatremia and SIADH.

Educational objective:
The administration of desmopressin, an analogue of antidiuretic hormone (ADH), can induce the syndrome of inappropriate ADH secretion. Urinary water excretion is impaired, leading to hypotonic hyponatremia. Laboratory studies, including serum electrolytes, urine osmolality, and

mediated water reabsorption slightly increases extracellular volume; however, increased natriuretic peptide secretion leads to sodium and water excretion, ultimately normalizing extracellular volume.

(Choice A) Although hypoxemia (eg, from pulmonary embolism) may manifest with nausea, elevated heart rate, and dizziness, this patient has no risk factors for pulmonary disease or symptoms of respiratory distress (eg, shortness of breath, chest pain). Therefore, serum electrolytes are a better initial test.

(Choice B) Although acute liver failure may cause excessive bleeding and present with nausea and dizziness, this patient lacks associated findings of jaundice and abdominal pain and has no risk factors (eg, infection, excess alcohol intake).

(Choice C) MRI of the brain can be used to assess for CNS pathology (eg, bleeding, acute stroke) that could manifest with headache or dizziness. However, this patient lacks focal neurologic signs; therefore, a metabolic workup with serum electrolytes is a more appropriate initial test.

(Choice D) Plasma desmopressin is not routinely measured. It may be high in this patient, given her recent medication use with the onset of menses, but serum electrolytes are a more rapid initial step for confirming hyponatremia and SIADH.

Educational objective:
The administration of desmopressin, an analogue of antidiuretic hormone (ADH), can induce the syndrome of inappropriate ADH secretion. Urinary water excretion is impaired, leading to hypotonic hyponatremia. Laboratory studies, including serum electrolytes, urine osmolality, and urine sodium, are the first step in establishing the diagnosis.

References

- Desmopressin and the risk of hyponatremia: a population-based cohort study.
- Intranasal desmopressin-induced hyponatremia.

Surgery	Endocrine, Diabetes & Metabolism	Hyponatremia
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 35-year-old man is brought to the emergency department due to weakness and lethargy. His friend could not get him out of bed this morning and called emergency medical services (EMS). The patient has a history of injection heroin use, but intramuscular naloxone administered by EMS personnel failed to improve his condition. Temperature is 38.1 C (100.6 F), blood pressure is 110/66 mm Hg, pulse is 104/min, and respirations are 19/min. There is ptosis of both eyes, and the pupils are dilated and sluggish to react. The patient is unable to hold his head up, and respirations are shallow. The lungs are clear on auscultation, and no cardiac murmurs are present. The abdomen is soft and nontender with normal bowel sounds. Two abscesses are present on the left thigh. Arterial blood gases reveal hypoxia and acute respiratory acidosis. The patient is intubated, and mechanical ventilation is begun. Which of the following is the best next step in management of this patient?

A. Comprehensive drug screen
B. Equine botulinum antitoxin
C. Intravenous buprenorphine
D. Intravenous naloxone infusion
E. Tetanus immune globulin

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 35-year-old man is brought to the emergency department due to weakness and lethargy. His friend could not get him out of bed this morning and called emergency medical services (EMS). The patient has a history of injection heroin use, but intramuscular naloxone administered by EMS personnel failed to improve his condition. Temperature is 38.1 C (100.6 F), blood pressure is 110/66 mm Hg, pulse is 104/min, and respirations are 19/min. There is ptosis of both eyes, and the pupils are dilated and sluggish to react. The patient is unable to hold his head up, and respirations are shallow. The lungs are clear on auscultation, and no cardiac murmurs are present. The abdomen is soft and nontender with normal bowel sounds. Two abscesses are present on the left thigh. Arterial blood gases reveal hypoxia and acute respiratory acidosis. The patient is intubated, and mechanical ventilation is begun. Which of the following is the best next step in management of this patient?

- A. Comprehensive drug screen (26%)
- ✓ B. Equine botulinum antitoxin (53%)
- C. Intravenous buprenorphine (4%)
- D. Intravenous naloxone infusion (7%)
- E. Tetanus immune globulin (8%)

Omitted
Correct answer
B

53%
Answered correctly

01 sec
Time Spent

04/27/2020
Last Updated

Explanation

This patient's cranial nerve (CN) palsy (ptosis, dilated pupil), acute hypoxemic respiratory failure, muscle weakness (eg, inability to hold the head up), and cutaneous abscesses raise strong suspicion for **wound botulism**. Most cases occur when *Clostridium botulinum* spores contaminate a **puncture wound** (eg, injection drug use), germinate in the anaerobic environment, and generate **botulinum toxin** *in vivo*. Botulism can also

This patient's cranial nerve (CN) palsy (ptosis, dilated pupil), acute hypoxemic respiratory failure, muscle weakness (eg, inability to hold the head up), and cutaneous abscesses raise strong suspicion for **wound botulism**. Most cases occur when *Clostridium botulinum* spores contaminate a **puncture wound** (eg, injection drug use), germinate in the anaerobic environment, and generate **botulinum toxin** *in vivo*. Botulism can also occur when spores (infant botulism) or preformed botulinum toxin (foodborne botulism) are ingested.

Exposure to botulinum toxin, which impairs the presynaptic release of acetylcholine at the neuromuscular junction, generally results in:

- Symmetric, **descending motor paresis** beginning with the **CNs**; this often includes CN III, CN IV, and CN VI (diplopia, ptosis, mydriasis) and CN IX and CN X (dysphagia, suppressed gag)
- Progressive respiratory compromise due to **diaphragmatic paralysis**
- Autonomic dysfunction (eg, ileus, orthostatic hypotension, urinary retention)

Because botulinum toxin targets the motor synapse, **sensory abnormalities and confusion are rare** (although lethargy from respiratory failure can occur). In contrast to infant or foodborne botulism, wound botulism is often associated with **fever and leukocytosis** and generally presents ~10 days (rather than within hours) after transmission.

Confirmation requires the isolation of *C botulinum* in culture or identification of toxin in serum. However, urgent treatment with **equine botulinum antitoxin** is required to prevent progression and should not be delayed for testing in suspected cases. Respiratory support and wound debridement are also often required.

(Choices A and D) Opioid intoxication (which can be reversed with the opioid antagonist naloxone) can cause weakness, lethargy, and respiratory failure; however, most patients have bradypnea, and ptosis is uncommon. Therefore, additional naloxone is not required in this patient. Although a drug screen may be helpful in the overall evaluation of this patient given his history of heroin use, it would not alter current management as he requires urgent treatment with antitoxin.

(Choice C) Intravenous buprenorphine can be used to treat symptoms of opioid withdrawal, which is usually characterized by flulike symptoms (eg, myalgia, rhinorrhea, diarrhea); cranial nerve palsies and respiratory failure would be atypical.

(Choice E) Tetanus is a neuromuscular disease caused by the toxin-producing *Clostridium tetani*. Risk is increased in those who use intravenous drugs. However, tetanus causes tonic contraction of skeletal muscles (eg, trismus, rigid abdomen) and severe muscle spasms.

Educational objective:

Confirmation requires the isolation of *C botulinum* in culture or identification of toxin in serum. However, urgent treatment with **equine botulinum antitoxin** is required to prevent progression and should not be delayed for testing in suspected cases. Respiratory support and wound debridement are also often required.

(Choices A and D) Opioid intoxication (which can be reversed with the opioid antagonist naloxone) can cause weakness, lethargy, and respiratory failure; however, most patients have bradypnea, and ptosis is uncommon. Therefore, additional naloxone is not required in this patient. Although a drug screen may be helpful in the overall evaluation of this patient given his history of heroin use, it would not alter current management as he requires urgent treatment with antitoxin.

(Choice C) Intravenous buprenorphine can be used to treat symptoms of opioid withdrawal, which is usually characterized by flulike symptoms (eg, myalgia, rhinorrhea, diarrhea); cranial nerve palsies and respiratory failure would be atypical.

(Choice E) Tetanus is a neuromuscular disease caused by the toxin-producing *Clostridium tetani*. Risk is increased in those who use intravenous drugs. However, tetanus causes tonic contraction of skeletal muscles (eg, trismus, rigid abdomen) and severe muscle spasms.

Educational objective:
Wound botulism occurs when *Clostridium botulinum* spores contaminate a puncture injury (eg, intravenous needle), germinate, and generate neurotoxin *in vivo*. Manifestations include symmetric, descending neurologic deficits (eg, cranial nerve palsy), respiratory compromise, and autonomic dysfunction. In contrast to foodborne and infant botulism, fever and leukocytosis may be present. Urgent treatment with equine botulinum antitoxin is required and should not be delayed for diagnostic evaluation.

References

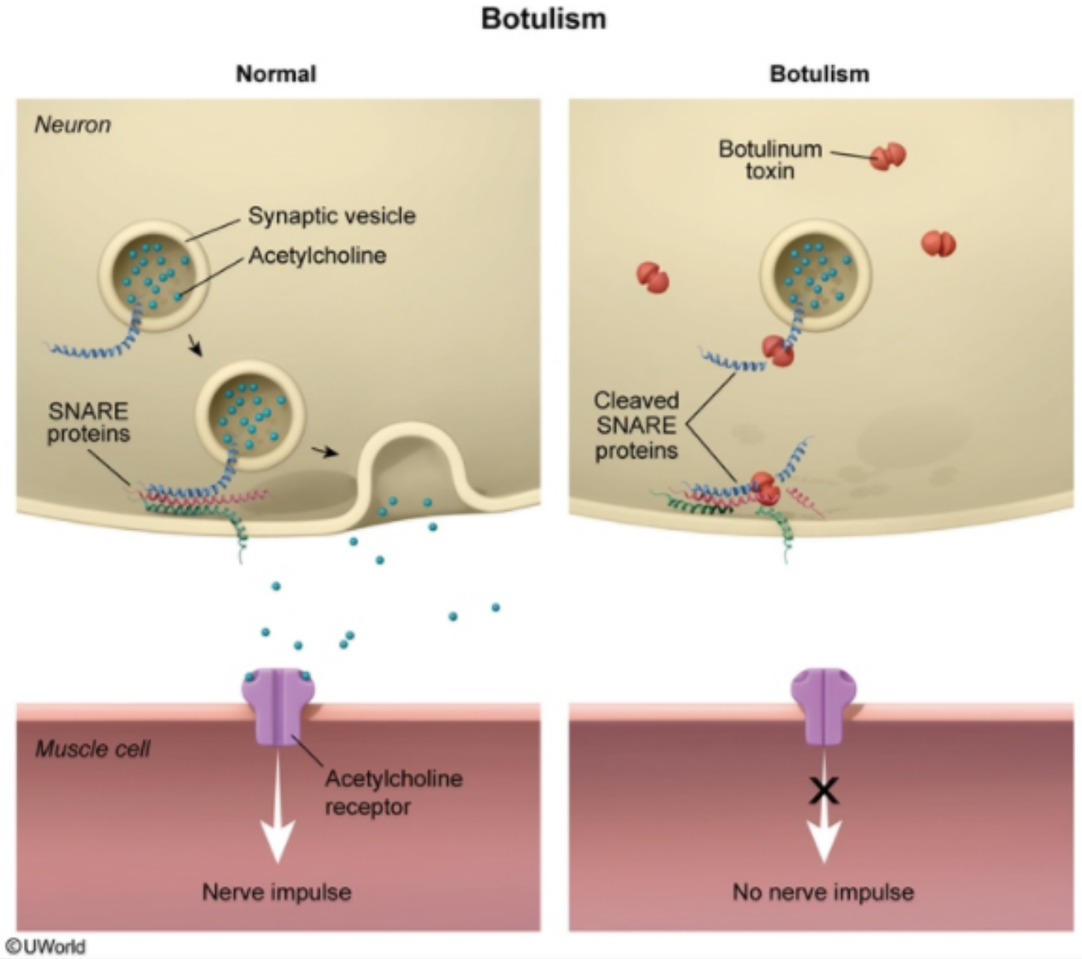
- Wound botulism outbreak among persons who use black tar heroin—San Diego County, California, 2017-2018.
- Outbreak of wound botulism in people who inject drugs, Norway, October to November 2013.

Surgery	Nervous System	Botulism
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Exhibit Display



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

patient. Although a drug screen may be helpful in the overall evaluation of this patient given his history of heroin use, it would not alter current

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 44-year-old obese woman undergoes an open cholecystectomy for complicated acute cholecystitis. She is receiving intravenous hydration, hydromorphone, and antibiotics. On the second postoperative day, her temperature is 36.7° C (98.2° F), blood pressure is 110/80 mm Hg, pulse is 92/min, and respirations are 12/min. Oxygen saturation is 89% on room air. Her arterial blood gas results are as follows:

Arterial pH	7.24
PaO_2	62 mm Hg
$PaCO_2$	59 mm Hg
HCO_3	28 mEq/L

What is the most likely cause of hypoxemia in this patient?

A. Acute pulmonary embolism
B. Alveolar hypoventilation
C. Atelectasis
D. Pleural effusion
E. Pulmonary edema

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 44-year-old obese woman undergoes an open cholecystectomy for complicated acute cholecystitis. She is receiving intravenous hydration, hydromorphone, and antibiotics. On the second postoperative day, her temperature is 36.7° C (98.2° F), blood pressure is 110/80 mm Hg, pulse is 92/min, and respirations are 12/min. Oxygen saturation is 89% on room air. Her arterial blood gas results are as follows:

Arterial pH	7.24
PaO_2	62 mm Hg
$PaCO_2$	59 mm Hg
HCO_3	28 mEq/L

What is the most likely cause of hypoxemia in this patient?

- A. Acute pulmonary embolism (3%)
- ✓ B. Alveolar hypoventilation (57%)
- C. Atelectasis (36%)
- D. Pleural effusion (0%)
- E. Pulmonary edema (1%)

Omitted
Correct answer
B

57%
Answered correctly

02 secs
Time Spent

06/23/2020
Last Updated

Explanation

This patient has respiratory acidosis evidenced by arterial blood gas values that show a decreased pH (<7.35) and a primary increase in $PaCO_2$ (>40 mm Hg). High $PaCO_2$ and low PaO_2 levels are suggestive of alveolar hypoventilation, although an elevated $PaCO_2$ alone, in the range of 50-80 mm Hg, is sufficient to make the diagnosis. Causes of alveolar hypoventilation and respiratory acidosis include the following:

- Pulmonary/thoracic diseases: Chronic obstructive pulmonary disease, obstructive sleep apnea, obesity hypoventilation, scoliosis
- Neuromuscular diseases: Myasthenia gravis, Lambert-Eaton syndrome, Guillain-Barré syndrome
- Drug-induced hypoventilation: Anesthetics, narcotics, sedatives
- Primary central nervous system dysfunction: Brainstem lesion, infection, stroke

In addition, the A-a gradient ($P_AO_2 - P_aO_2$) can help determine the specific cause of hypoxemia. The A-a gradient is a measure of oxygen transfer from the alveoli to the blood. The alveolar oxygen tension can be calculated using the following equation:

$$PAO_2 = (FiO_2 \times [Patm - PH_2O]) - (PaCO_2/R) = (0.21 \times [760-47]) - (59/0.8) = 76$$

Then, calculate the A-a gradient:

$$\text{A-a gradient} = P_AO_2 - P_aO_2 = 76 - 62 = 14$$

A normal A-a gradient is <15. Values increase with age, but an A-a gradient >30 is considered elevated regardless of age.

The A-a gradient is normal in patients with reduced inspired oxygen tension and hypoventilation.

Recent subdiaphragmatic surgery, narcotic pain medications, and obesity make this patient at risk for alveolar hypoventilation. The resultant respiratory acidosis confirms the hypoventilation (CO_2 retention).

(Choices A, C, D, and E) Pulmonary embolism, atelectasis, pleural effusion, and pulmonary edema cause V/Q mismatch. In V/Q mismatch, the A-a gradient is elevated. In all these conditions, there is a decrease in $PaCO_2$ (respiratory alkalosis) due to compensatory tachypnea.

Educational objective:
Hypoxemia can be caused by reduced inspired oxygen tension, hypoventilation, diffusion limitation, shunt, and V/Q mismatch. Hypoventilation is associated with a normal A-a gradient and respiratory acidosis.

Surgery Pulmonary & Critical Care Acute respiratory failure

- Pulmonary/thoracic diseases: Chronic obstructive pulmonary disease, obstructive sleep apnea, obesity hypoventilation, scoliosis
- Neuromuscular diseases: Myasthenia gravis, Lambert-Eaton syndrome, Guillain-Barré syndrome
- Drug-induced hypoventilation: Anesthetics, narcotics, sedatives
- Primary central nervous system dysfunction: Brainstem lesion, infection, stroke

In addition, the A-a gradient ($P_AO_2 - P_aO_2$) can help determine the specific cause of hypoxemia. The A-a gradient is a measure of oxygen transfer from the alveoli to the blood. The alveolar oxygen tension can be calculated using the following equation:

$$PAO_2 = (FiO_2 \times [Patm - PH_2O]) - (PaCO_2/R) = (0.21 \times [760-47]) - (59/0.8) = 76$$

Then, calculate the A-a gradient:

$$\text{A-a gradient} = P_AO_2 - P_aO_2 = 76 - 62 = 14$$

A normal A-a gradient is <15. Values increase with age, but an A-a gradient >30 is considered elevated regardless of age.

The A-a gradient is normal in patients with reduced inspired oxygen tension and hypoventilation.

Recent subdiaphragmatic surgery, narcotic pain medications, and obesity make this patient at risk for alveolar hypoventilation. The resultant respiratory acidosis confirms the hypoventilation (CO_2 retention).

(Choices A, C, D, and E) Pulmonary embolism, atelectasis, pleural effusion, and pulmonary edema cause V/Q mismatch. In V/Q mismatch, the A-a gradient is elevated. In all these conditions, there is a decrease in $PaCO_2$ (respiratory alkalosis) due to compensatory tachypnea.

Educational objective:
Hypoxemia can be caused by reduced inspired oxygen tension, hypoventilation, diffusion limitation, shunt, and V/Q mismatch. Hypoventilation is associated with a normal A-a gradient and respiratory acidosis.

Surgery	Pulmonary & Critical Care	Acute respiratory failure
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 65-year-old man comes to the emergency department due to acute right flank pain. The pain started an hour ago and he has vomited twice. The pain is 10 on a scale of 0-10 in severity, is crampy, and waxes and wanes. The patient has never before had similar pain. He reports passing "sand" occasionally in his urine. Medical history is significant for obesity, hyperlipidemia, hypertension, gout, and claustrophobia. The patient does not use tobacco, alcohol, or illicit drugs. He is afebrile. Blood pressure is 160/100 mm Hg, pulse is 98/min, and respirations are 16/min. BMI is 54 kg/m^2. The abdomen is obese and bowel sounds are decreased. Mild tenderness is present over the right flank. Urinalysis shows hematuria and a urine pH of 5. Abdominal ultrasonogram shows right-sided hydronephrosis and dilation of the proximal ureter. Which of the following is the most likely cause of this patient's current symptoms?

A. Decreased intestinal absorption of oxalate
B. Increased release of calcium from bone
C. Increased urinary excretion of calcium and phosphorus
D. Presence of urea-splitting bacteria
E. Supersaturation of urine with uric acid

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

A 65-year-old man comes to the emergency department due to acute right flank pain. The pain started an hour ago and he has vomited twice. The pain is 10 on a scale of 0-10 in severity, is crampy, and waxes and wanes. The patient has never before had similar pain. He reports passing "sand" occasionally in his urine. Medical history is significant for obesity, hyperlipidemia, hypertension, gout, and claustrophobia. The patient does not use tobacco, alcohol, or illicit drugs. He is afebrile. Blood pressure is 160/100 mm Hg, pulse is 98/min, and respirations are 16/min. BMI is 54 kg/m^2. The abdomen is obese and bowel sounds are decreased. Mild tenderness is present over the right flank. Urinalysis shows hematuria and a urine pH of 5. Abdominal ultrasonogram shows right-sided hydronephrosis and dilation of the proximal ureter. Which of the following is the most likely cause of this patient's current symptoms?

- A. Decreased intestinal absorption of oxalate (9%)
- B. Increased release of calcium from bone (1%)
- C. Increased urinary excretion of calcium and phosphorus (14%)
- D. Presence of urea-splitting bacteria (8%)
- ✓ E. Supersaturation of urine with uric acid (65%)

Omitted
Correct answer
E

65%
Answered correctly

01 sec
Time Spent

01/27/2020
Last Updated

Explanation

Uric acid kidney stones	
	• **Increased uric acid excretion**: Gout, myeloproliferative disorders

Uric acid kidney stones	
Risk factors	• **Increased uric acid excretion**: Gout, myeloproliferative disorders • **Increased urine concentration**: Hot, arid climates; dehydration • **Low urine pH**: Chronic diarrhea (GI bicarbonate loss), metabolic syndrome/diabetes mellitus
Pathophysiology	• Acidic urine favors formation of uric acid (insoluble) over urate (soluble) • Supersaturation of urine with uric acid precipitates crystal formation
Clinical characteristics	• Radiolucent stones (not visible on x-ray) • Uric acid crystals on urine microscopy • Urine pH usually <5.5
Treatment	• Alkalinization of urine (potassium citrate)

GI = gastrointestinal.

This patient has colicky flank pain, hematuria, and hydronephrosis, consistent with acute ureterolithiasis. In light of the acidic urine and history of gout, this patient's symptoms are most likely due to **uric acid stones**. **Excess urinary excretion of uric acid** in the setting of **low urine pH** can cause **supersaturation** of urine and the formation of uric acid crystals. The stones are radiolucent and typically not visible on x-ray but can be seen on CT scan. Ultrasound is useful in detecting large stones but less sensitive for ureteral or small stones, although, depending on stone location and extent of possible obstruction, ureteral dilation or hydronephrosis may be seen. Patients often report passage of small crystals ("**sand**") in the urine, but this is not a specific symptom.

Risk factors for uric acid stones include gout, obesity, diabetes mellitus/metabolic syndrome, chronic diarrhea (due to intestinal bicarbonate loss and compensatory acidification of the urine), and increased systemic uric acid production (eg, myeloproliferative disorders, hemolytic anemia). Alkalinization of the urine with **potassium citrate** or potassium bicarbonate effectively dissolves the stones, and interventional efforts to clear the stones (eg, ureteroscopic extraction) are usually unnecessary.

(Choice A) Malabsorption of fat (eg, Crohn disease) leads to increased binding of calcium by fat in the intestinal lumen, which causes less

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

This patient has colicky flank pain, hematuria, and hydronephrosis, consistent with acute ureterolithiasis. In light of the acidic urine and history of gout, this patient's symptoms are most likely due to **uric acid stones**. **Excess urinary excretion of uric acid** in the setting of **low urine pH** can cause **supersaturation** of urine and the formation of uric acid crystals. The stones are radiolucent and typically not visible on x-ray but can be seen on CT scan. Ultrasound is useful in detecting large stones but less sensitive for ureteral or small stones, although, depending on stone location and extent of possible obstruction, ureteral dilation or hydronephrosis may be seen. Patients often report passage of small crystals ("**sand**") in the urine, but this is not a specific symptom.

Risk factors for uric acid stones include gout, obesity, diabetes mellitus/metabolic syndrome, chronic diarrhea (due to intestinal bicarbonate loss and compensatory acidification of the urine), and increased systemic uric acid production (eg, myeloproliferative disorders, hemolytic anemia). Alkalinization of the urine with **potassium citrate** or potassium bicarbonate effectively dissolves the stones, and interventional efforts to clear the stones (eg, ureteroscopic extraction) are usually unnecessary.

(Choice A) Malabsorption of fat (eg, Crohn disease) leads to increased binding of calcium by fat in the intestinal lumen, which causes less calcium to be available to form insoluble oxalate complexes, facilitating *increased* intestinal absorption of oxalate. Renal clearance of the excess oxalate leads to calcium oxalate kidney stones. However, *decreased* oxalate absorption would not increase the risk.

(Choices B and C) Increased release of calcium and phosphorus from bone in hyperparathyroidism can increase the risk of calcium oxalate or calcium phosphate stones. Although tubular reabsorption of calcium is increased, net urinary calcium excretion is increased due to the excess filtered calcium load. However, this patient does not have other symptoms of hyperparathyroidism (eg, fatigue, bone pain), and his acidic urine and risk factors (eg, gout, obesity) suggest uric acid stones.

(Choice D) Hydrolysis of urea yields ammonia, which alkalinizes the urine and facilitates the precipitation of magnesium ammonium phosphate (struvite) crystals; recurrent upper urinary tract infection with urease-producing organisms (eg, *Proteus*, *Klebsiella*) can cause struvite stones. Because of the large quantities of urea in urine, these stones can grow rapidly and fill the renal calyces (staghorn calculi). This patient has acidic urine and small stones that are unlikely to be composed of struvite.

Educational objective:
Excess urinary excretion of uric acid and low urine pH can lead to supersaturation of urine and the formation of uric acid stones. Risk factors include gout, obesity, diabetes mellitus/metabolic syndrome, chronic diarrhea (due to acidification of the urine), and increased systemic uric acid production. Alkalization of the urine with potassium citrate effectively dissolves the stones.

("**sand**") in the urine, but this is not a specific symptom.

Risk factors for uric acid stones include gout, obesity, diabetes mellitus/metabolic syndrome, chronic diarrhea (due to intestinal bicarbonate loss and compensatory acidification of the urine), and increased systemic uric acid production (eg, myeloproliferative disorders, hemolytic anemia). Alkalinization of the urine with **potassium citrate** or potassium bicarbonate effectively dissolves the stones, and interventional efforts to clear the stones (eg, ureteroscopic extraction) are usually unnecessary.

(Choice A) Malabsorption of fat (eg, Crohn disease) leads to increased binding of calcium by fat in the intestinal lumen, which causes less calcium to be available to form insoluble oxalate complexes, facilitating *increased* intestinal absorption of oxalate. Renal clearance of the excess oxalate leads to calcium oxalate kidney stones. However, *decreased* oxalate absorption would not increase the risk.

(Choices B and C) Increased release of calcium and phosphorus from bone in hyperparathyroidism can increase the risk of calcium oxalate or calcium phosphate stones. Although tubular reabsorption of calcium is increased, net urinary calcium excretion is increased due to the excess filtered calcium load. However, this patient does not have other symptoms of hyperparathyroidism (eg, fatigue, bone pain), and his acidic urine and risk factors (eg, gout, obesity) suggest uric acid stones.

(Choice D) Hydrolysis of urea yields ammonia, which alkalinizes the urine and facilitates the precipitation of magnesium ammonium phosphate (struvite) crystals; recurrent upper urinary tract infection with urease-producing organisms (eg, *Proteus*, *Klebsiella*) can cause struvite stones. Because of the large quantities of urea in urine, these stones can grow rapidly and fill the renal calyces (staghorn calculi). This patient has acidic urine and small stones that are unlikely to be composed of struvite.

Educational objective:
Excess urinary excretion of uric acid and low urine pH can lead to supersaturation of urine and the formation of uric acid stones. Risk factors include gout, obesity, diabetes mellitus/metabolic syndrome, chronic diarrhea (due to acidification of the urine), and increased systemic uric acid production. Alkalization of the urine with potassium citrate effectively dissolves the stones.

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

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 33-year-old man comes to the hospital due to left flank pain. The patient has never had these symptoms previously. He has been told during past physicals that his blood pressure is elevated, but he never followed up. The patient's father died suddenly in his sleep at age 42. Blood pressure is 170/100 mm Hg in both arms, and pulse is 82/min. Cardiopulmonary examination is normal. The abdomen is soft, and mild tenderness is noted in the left flank. Renal ultrasonogram reveals mildly enlarged kidneys containing multiple cysts of varying sizes; echogenic foci compatible with nephrolithiasis are also noted in the left kidney. The patient's pain is well controlled with analgesics. However, his blood pressure remains elevated. Which of the following is the most likely cause of hypertension in this patient?

A. Decreased production of vasopressin
B. Decreased renal production of prostaglandins
C. Increased circulating norepinephrine levels
D. Increased production of cortisol
E. Increased production of erythropoietin
F. Increased renal blood flow
G. Increased renin activity

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 33-year-old man comes to the hospital due to left flank pain. The patient has never had these symptoms previously. He has been told during past physicals that his blood pressure is elevated, but he never followed up. The patient's father died suddenly in his sleep at age 42. Blood pressure is 170/100 mm Hg in both arms, and pulse is 82/min. Cardiopulmonary examination is normal. The abdomen is soft, and mild tenderness is noted in the left flank. Renal ultrasonogram reveals mildly enlarged kidneys containing multiple cysts of varying sizes; echogenic foci compatible with nephrolithiasis are also noted in the left kidney. The patient's pain is well controlled with analgesics. However, his blood pressure remains elevated. Which of the following is the most likely cause of hypertension in this patient?

A. Decreased production of vasopressin (0%)
B. Decreased renal production of prostaglandins (4%)
C. Increased circulating norepinephrine levels (1%)
D. Increased production of cortisol (0%)
E. Increased production of erythropoietin (2%)
F. Increased renal blood flow (1%)
✓ G. Increased renin activity (87%)

Omitted
Correct answer
G

87%
Answered correctly

01 sec
Time Spent

05/19/2020
Last Updated

Explanation

This patient likely has **autosomal dominant polycystic kidney disease (ADPKD)**. Affected patients begin developing asymptomatic kidney

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

This patient likely has **autosomal dominant polycystic kidney disease (ADPKD)**. Affected patients begin developing asymptomatic kidney cysts early in life. By age 30-40, the cystic changes have often progressed to the point that disease manifestations become clinically apparent. The most common early disease manifestations include flank pain, hematuria, and **hypertension**.

Hypertension typically precedes any clinically detectable renal dysfunction and its progression correlates with the cystic structural derangement of the kidneys. It is believed the hypertension results from cyst expansion leading to **localized renal ischemia** and consequent **increased renin release**. The increased activation of the renin-angiotensin-aldosterone system (RAAS) in effect leads to **secondary hyperaldosteronism**. Due to their inhibition of RAAS, **ACE inhibitors** (eg, lisinopril) are the drugs of choice for treating hypertension in ADPKD.

Other complications of ADPKD include nephrolithiasis (most commonly uric acid stones due in part to a tendency toward acidic urine in ADPKD) and cerebral aneurysms. The sudden death of this patient's father at a young age suggests rupture of a cerebral aneurysm in the setting of ADPKD.

(Choice A) Urine concentrating ability is reduced in ADPKD due to cystic destruction of nephron distal tubules and impairment of vasopressin (V2) receptors. In effect, a mild nephrogenic diabetes insipidus is created, leading to upregulated and increased production of vasopressin.

(Choices B and F) Renal blood flow (RBF) decreases as cystic structural derangement of the kidneys progresses and damages the renal vasculature. In response, production of prostaglandins increases to attempt to dilate renal afferent arterioles and restore RBF.

(Choices C and D) Circulating norepinephrine levels are increased in pheochromocytoma, and cortisol production is increased in Cushing syndrome. Both disorders commonly result from a functioning adrenal adenoma and lead to secondary hypertension; however, this patient's multiple renal cysts make ADPKD more likely.

(Choice E) Early in the course of ADPKD, erythropoietin levels may be increased, resulting in mild polycythemia; however, the increase is not a major cause of hypertension. As ADPKD progresses, erythropoietin levels decrease as structural derangement progresses and chronic kidney disease develops.

Educational objective:
Hypertension is one of the earliest clinical manifestations of autosomal dominant polycystic kidney disease. It likely results from cyst expansion leading to localized renal ischemia and consequent increased renin production with activation of the renin-angiotensin-aldosterone system. Therefore, the hypertension is best treated with ACE inhibitors (eg, lisinopril).

Other complications of ADPKD include nephrolithiasis (most commonly uric acid stones due in part to a tendency toward acidic urine in ADPKD) and cerebral aneurysms. The sudden death of this patient's father at a young age suggests rupture of a cerebral aneurysm in the setting of ADPKD.

(Choice A) Urine concentrating ability is reduced in ADPKD due to cystic destruction of nephron distal tubules and impairment of vasopressin (V2) receptors. In effect, a mild nephrogenic diabetes insipidus is created, leading to upregulated and increased production of vasopressin.

(Choices B and F) Renal blood flow (RBF) decreases as cystic structural derangement of the kidneys progresses and damages the renal vasculature. In response, production of prostaglandins increases to attempt to dilate renal afferent arterioles and restore RBF.

(Choices C and D) Circulating norepinephrine levels are increased in pheochromocytoma, and cortisol production is increased in Cushing syndrome. Both disorders commonly result from a functioning adrenal adenoma and lead to secondary hypertension; however, this patient's multiple renal cysts make ADPKD more likely.

(Choice E) Early in the course of ADPKD, erythropoietin levels may be increased, resulting in mild polycythemia; however, the increase is not a major cause of hypertension. As ADPKD progresses, erythropoietin levels decrease as structural derangement progresses and chronic kidney disease develops.

Educational objective:
Hypertension is one of the earliest clinical manifestations of autosomal dominant polycystic kidney disease. It likely results from cyst expansion leading to localized renal ischemia and consequent increased renin production with activation of the renin-angiotensin-aldosterone system. Therefore, the hypertension is best treated with ACE inhibitors (eg, lisinopril).

References

- Hypertension in autosomal dominant polycystic kidney disease.

Surgery	Renal, Urinary Systems & Electrolytes	Polycystic kidney disease
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

A 63-year-old man comes to the office due to anorexia and weight loss for the past 2 months. He has no chest pain, abdominal pain, cough, or fever. His medical problems include hypertension and latent tuberculosis treated 30 years ago. He does not use tobacco, alcohol, or illicit drugs. Temperature is 37.5 C (99.5 F), blood pressure is 124/80 mm Hg, pulse is 78/min, and respirations are 14/min. Physical examination reveals mucosal pallor and mild hepatomegaly. The abdomen is soft, nondistended, and nontender. Cardiopulmonary examination is normal. Fecal occult blood testing is positive. Laboratory results are as follows:

Complete blood count	
Hemoglobin	9.8 g/dL
Mean corpuscular volume	72 μm^3
Platelets	276,000/mm^3
Leukocytes	6,700/mm^3
Liver function studies	
Total bilirubin	1.3 mg/dL
Alkaline phosphatase	190 U/L
Aspartate aminotransferase (SGOT)	32 U/L
Alanine aminotransferase (SGPT)	38 U/L

Ultrasound reveals a solitary liver lesion measuring 2x3 cm. Which is the most likely diagnosis?

A. Angiosarcoma of the liver
B. Cholangiocarcinoma
C. Focal nodular hyperplasia

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Platelets	276,000/mm^3
Leukocytes	6,700/mm^3

Liver function studies

Total bilirubin	1.3 mg/dL
Alkaline phosphatase	190 U/L
Aspartate aminotransferase (SGOT)	32 U/L
Alanine aminotransferase (SGPT)	38 U/L

Ultrasound reveals a solitary liver lesion measuring 2x3 cm. Which is the most likely diagnosis?

A. Angiosarcoma of the liver
B. Cholangiocarcinoma
C. Focal nodular hyperplasia
D. Hepatic adenoma
E. Hepatic tuberculosis
F. Hepatocellular carcinoma
G. Metastatic disease to the liver

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Platelets	276,000/mm^3
Leukocytes	6,700/mm^3
Liver function studies	
Total bilirubin	1.3 mg/dL
Alkaline phosphatase	190 U/L
Aspartate aminotransferase (SGOT)	32 U/L
Alanine aminotransferase (SGPT)	38 U/L

Ultrasound reveals a solitary liver lesion measuring 2x3 cm. Which is the most likely diagnosis?

- A. Angiosarcoma of the liver (6%)
- B. Cholangiocarcinoma (10%)
- C. Focal nodular hyperplasia (1%)
- D. Hepatic adenoma (6%)
- E. Hepatic tuberculosis (5%)
- F. Hepatocellular carcinoma (14%)
- ✓ G. Metastatic disease to the liver (55%)

Omitted
Correct answer

55%
Answered correctly

03 secs
Time Spent

03/26/2020
Last Updated

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Solid liver masses	
Focal nodular hyperplasia	• Associated with anomalous arteries • Arterial flow & central scar on imaging
Hepatic adenoma	• Women on long-term oral contraceptives • Possible hemorrhage or malignant transformation
Regenerative nodules	• Acute or chronic liver injury (eg, cirrhosis)
Hepatocellular carcinoma	• Systemic symptoms • Chronic hepatitis or cirrhosis • Elevated alpha-fetoprotein
Liver metastasis	• Single/multiple lesions • Known extrahepatic malignancy

©UWorld

Metastatic disease is the most common cause of **liver mass** and is much more common than primary liver cancer. Undiagnosed **colorectal cancer** (CRC) is likely in this patient with a solitary liver mass, probable iron deficiency anemia (low mean corpuscular volume), and positive fecal occult blood screen. Gastrointestinal malignancies, such as colorectal or pancreatic cancer, are the most frequent source of liver metastases as their venous drainage is through the portal system directly to the liver. Lung, breast, and skin cancers (melanoma) often also spread to the liver. The liver is a common site of metastatic disease due to its dual blood supply (systemic and portal) and hepatic sinusoidal fenestrations allowing for easier metastatic deposition.

Liver metastases are often clinically silent unless pressure on the liver capsule or obstruction of the biliary tree causes pain or jaundice. Results of

©UWorld

Metastatic disease is the most common cause of **liver mass** and is much more common than primary liver cancer. Undiagnosed **colorectal cancer** (CRC) is likely in this patient with a solitary liver mass, probable iron deficiency anemia (low mean corpuscular volume), and positive fecal occult blood screen. Gastrointestinal malignancies, such as colorectal or pancreatic cancer, are the most frequent source of liver metastases as their venous drainage is through the portal system directly to the liver. Lung, breast, and skin cancers (melanoma) often also spread to the liver. The liver is a common site of metastatic disease due to its dual blood supply (systemic and portal) and hepatic sinusoidal fenestrations allowing for easier metastatic deposition.

Liver metastases are often clinically silent unless pressure on the liver capsule or obstruction of the biliary tree causes pain or jaundice. Results of hepatobiliary laboratory testing (eg, alkaline phosphatase) may be normal or mildly elevated, even in the setting of heavy tumor burden. **Multiple** hepatic nodules are typically seen in metastatic disease; however, **solitary** lesions are not uncommon. If a primary tumor is identified (eg, with colonoscopy), liver biopsy is usually not needed.

(Choice A) Hepatic angiosarcoma is a rare liver neoplasm more common in older men who have been exposed to toxins (eg, vinyl chloride gas, inorganic arsenic compounds, thorium dioxide).

(Choice B) Cholangiocarcinoma typically presents with symptoms of biliary obstruction - jaundice, pruritus, light-colored stools, and dark urine. The main risk factor is a history of primary sclerosing cholangitis.

(Choices C and D) Focal nodular hyperplasia (FNH) and hepatic adenoma are usually benign liver tumors seen in young women. FNH is typically asymptomatic; hepatic adenoma may cause right upper quadrant pain and is associated with oral contraceptive use.

(Choice E) Primary hepatic tuberculosis is rare due to the low oxygen tension in the liver. Even with disseminated tuberculosis, a solitary liver mass would be unlikely.

(Choice F) Hepatocellular carcinoma (HCC) typically emerges from a chronically inflamed liver (eg, chronic hepatitis B or C infection). HCC is the most common type of primary liver cancer but is a far less common cause of hepatic malignancy than metastasis from another source. Microcytic anemia and a positive fecal occult blood screen make CRC more likely in this patient.

Educational objective:
The most common malignancy of the liver is metastasis from another primary source.

Liver metastases are often clinically silent unless pressure on the liver capsule or obstruction of the biliary tree causes pain or jaundice. Results of hepatobiliary laboratory testing (eg, alkaline phosphatase) may be normal or mildly elevated, even in the setting of heavy tumor burden. **Multiple** hepatic nodules are typically seen in metastatic disease; however, **solitary** lesions are not uncommon. If a primary tumor is identified (eg, with colonoscopy), liver biopsy is usually not needed.

(Choice A) Hepatic angiosarcoma is a rare liver neoplasm more common in older men who have been exposed to toxins (eg, vinyl chloride gas, inorganic arsenic compounds, thorium dioxide).

(Choice B) Cholangiocarcinoma typically presents with symptoms of biliary obstruction - jaundice, pruritus, light-colored stools, and dark urine. The main risk factor is a history of primary sclerosing cholangitis.

(Choices C and D) Focal nodular hyperplasia (FNH) and hepatic adenoma are usually benign liver tumors seen in young women. FNH is typically asymptomatic; hepatic adenoma may cause right upper quadrant pain and is associated with oral contraceptive use.

(Choice E) Primary hepatic tuberculosis is rare due to the low oxygen tension in the liver. Even with disseminated tuberculosis, a solitary liver mass would be unlikely.

(Choice F) Hepatocellular carcinoma (HCC) typically emerges from a chronically inflamed liver (eg, chronic hepatitis B or C infection). HCC is the most common type of primary liver cancer but is a far less common cause of hepatic malignancy than metastasis from another source. Microcytic anemia and a positive fecal occult blood screen make CRC more likely in this patient.

Educational objective:
The most common malignancy of the liver is metastasis from another primary source.

References

- Epidemiology of primary and secondary liver cancers.

Surgery	Gastrointestinal & Nutrition	Metastatic liver disease
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 36-year-old woman comes to the emergency department due to severe headache and vision disturbance. The symptoms began abruptly an hour ago, and since then she has also felt weak, dizzy, and nauseated. The patient has had no similar symptoms in the past. Medical history is significant for a prolactinoma diagnosed a month ago, which is being treated with cabergoline. She does not use tobacco, alcohol, or illicit drugs. Temperature is 37.6 C (99.7 F), supine blood pressure is 80/50 mm Hg with a decrease to 60/40 mm Hg on standing, and pulse is 110/min. On physical examination, the patient appears anxious and in moderate distress. There is mild ptosis and impaired adduction on the right. Bitemporal hemianopsia is present. Bilateral upper and lower extremity muscle strength and sensation are normal. The neck veins are flat, heart and lung sounds are normal, and there is no abdominal tenderness or extremity edema. Which of the following is the most likely underlying cause of this patient's hemodynamic changes?

A. Decreased adrenal hormone levels
B. Dopaminergic medication adverse effect
C. Increased global intracranial pressure
D. Loss of central sympathetic output
E. Subarachnoid blood-induced vasospasm

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 36-year-old woman comes to the emergency department due to severe headache and vision disturbance. The symptoms began abruptly an hour ago, and since then she has also felt weak, dizzy, and nauseated. The patient has had no similar symptoms in the past. Medical history is significant for a prolactinoma diagnosed a month ago, which is being treated with cabergoline. She does not use tobacco, alcohol, or illicit drugs. Temperature is 37.6 C (99.7 F), supine blood pressure is 80/50 mm Hg with a decrease to 60/40 mm Hg on standing, and pulse is 110/min. On physical examination, the patient appears anxious and in moderate distress. There is mild ptosis and impaired adduction on the right. Bitemporal hemianopsia is present. Bilateral upper and lower extremity muscle strength and sensation are normal. The neck veins are flat, heart and lung sounds are normal, and there is no abdominal tenderness or extremity edema. Which of the following is the most likely underlying cause of this patient's hemodynamic changes?

- A. Decreased adrenal hormone levels (33%)
- B. Dopaminergic medication adverse effect (11%)
- C. Increased global intracranial pressure (25%)
- D. Loss of central sympathetic output (18%)
- E. Subarachnoid blood-induced vasospasm (10%)

Omitted
Correct answer
A

33%
Answered correctly

02 secs
Time Spent

04/28/2020
Last Updated

Explanation

This patient with a history of a **pituitary adenoma** who has severe headache, ptosis, and vision changes most likely has **pituitary apoplexy**. Pituitary apoplexy typically involves sudden hemorrhage into an enlarged pituitary adenoma (eg, prolactinoma). Most cases occur without a clear

This patient with a history of a **pituitary adenoma** who has severe headache, ptosis, and vision changes most likely has **pituitary apoplexy**. Pituitary apoplexy typically involves sudden hemorrhage into an enlarged pituitary adenoma (eg, prolactinoma). Most cases occur without a clear precipitating cause, although size appears to be a risk factor, possibly due to the expanding mass outgrowing or compressing its blood supply.

Bleeding into the tight anatomic space of the sella turcica can cause sudden-onset, severe headache as well as visual disturbances (eg, diplopia, bitemporal hemianopsia) and eye dysfunction (eg, ptosis) due to compression of the oculomotor nerves or optic chiasm. In addition, there is typically loss of all pituitary function; in the acute setting the loss of ACTH is most important and can lead to **adrenal crisis** (acute adrenal insufficiency).

Cortisol helps maintain vascular tone by potentiating the vasoconstrictive effects of catecholamines (eg, norepinephrine). In the absence of ACTH, the adrenal cortex ceases production of cortisol and **severe hypotension** and **distributive shock** can develop. Hypoglycemia may also be present. Treatment involves rapid volume resuscitation and prompt administration of intravenous glucocorticoids (eg, hydrocortisone, dexamethasone). Neurosurgical intervention may also be necessary.

(Choice B) Dopamine inhibits prolactin secretion, and dopamine agonists (eg, cabergoline, bromocriptine) are used as initial treatment for prolactinoma and can cause orthostatic hypotension. These drugs are not known to precipitate pituitary apoplexy (eg, sudden headache, visual disturbances, eye dysfunction).

(Choice C) Pseudotumor cerebri (idiopathic intracranial hypertension) most commonly affects overweight, premenopausal women and can present with headaches and diplopia. However, it would not explain severe hypotension and instead tends to cause hypertension and bradycardia (via the Cushing reflex).

(Choice D) Neurogenic shock results from loss of sympathetic tone due to spinal cord injury. Patients develop severe hypotension, but it is usually accompanied by bradycardia rather than tachycardia. Neurogenic shock is extremely unlikely in this patient with normal strength and sensation in all extremities.

(Choice E) Subarachnoid hemorrhage most commonly occurs due to rupture of a saccular cerebral aneurysm and presents with the abrupt onset of severe headache. Visual disturbances may be present, but severe hypotension does not occur.

Educational objective:
Pituitary apoplexy involves sudden hemorrhage into an enlarged pituitary adenoma. Patients typically have sudden onset of severe headache and

ACTH, the adrenal cortex ceases production of cortisol and **severe hypotension** and **distributive shock** can develop. Hypoglycemia may also be present. Treatment involves rapid volume resuscitation and prompt administration of intravenous glucocorticoids (eg, hydrocortisone, dexamethasone). Neurosurgical intervention may also be necessary.

(Choice B) Dopamine inhibits prolactin secretion, and dopamine agonists (eg, cabergoline, bromocriptine) are used as initial treatment for prolactinoma and can cause orthostatic hypotension. These drugs are not known to precipitate pituitary apoplexy (eg, sudden headache, visual disturbances, eye dysfunction).

(Choice C) Pseudotumor cerebri (idiopathic intracranial hypertension) most commonly affects overweight, premenopausal women and can present with headaches and diplopia. However, it would not explain severe hypotension and instead tends to cause hypertension and bradycardia (via the Cushing reflex).

(Choice D) Neurogenic shock results from loss of sympathetic tone due to spinal cord injury. Patients develop severe hypotension, but it is usually accompanied by bradycardia rather than tachycardia. Neurogenic shock is extremely unlikely in this patient with normal strength and sensation in all extremities.

(Choice E) Subarachnoid hemorrhage most commonly occurs due to rupture of a saccular cerebral aneurysm and presents with the abrupt onset of severe headache. Visual disturbances may be present, but severe hypotension does not occur.

Educational objective:
Pituitary apoplexy involves sudden hemorrhage into an enlarged pituitary adenoma. Patients typically have sudden onset of severe headache and visual disturbances. There is also loss of pituitary function; because cortisol helps maintain vascular tone, the absence of ACTH-induced cortisol production can lead to adrenal crisis (acute adrenal insufficiency) with severe hypotension and distributive shock.

References

- Pituitary apoplexy.

Surgery	Nervous System	Pituitary apoplexy
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 38-year-old man comes to the emergency department for evaluation of jaw swelling and pain. Two weeks ago, the patient cracked a molar in his right lower jaw after biting on an unpopped popcorn kernel and underwent tooth extraction. Yesterday, he developed a fever and the right side of his jaw began to swell. The pain has been worsening in that area, and the patient is having trouble swallowing. Temperature is 38.2 C (100.8 F), blood pressure is 130/82 mm Hg, pulse is 112/min, and respirations are 22/min. Oxygen saturation is 99% on room air. On examination, the patient appears ill and is drooling. His tongue appears elevated and is displaced posteriorly. The floor of the patient's mouth feels firm. His neck is erythematous, warm, and feels woody. This patient is at greatest risk for which of the following immediate complications?

A. Acute necrotizing mediastinitis
B. Airway obstruction
C. Carotid artery rupture
D. Cavernous sinus thrombosis
E. Facial nerve palsy
F. Spinal epidural abscess

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

A 38-year-old man comes to the emergency department for evaluation of jaw swelling and pain. Two weeks ago, the patient cracked a molar in his right lower jaw after biting on an unpopped popcorn kernel and underwent tooth extraction. Yesterday, he developed a fever and the right side of his jaw began to swell. The pain has been worsening in that area, and the patient is having trouble swallowing. Temperature is 38.2 C (100.8 F), blood pressure is 130/82 mm Hg, pulse is 112/min, and respirations are 22/min. Oxygen saturation is 99% on room air. On examination, the patient appears ill and is drooling. His tongue appears elevated and is displaced posteriorly. The floor of the patient's mouth feels firm. His neck is erythematous, warm, and feels woody. This patient is at greatest risk for which of the following immediate complications?

- A. Acute necrotizing mediastinitis (14%)
- ✓ B. Airway obstruction (80%)
- C. Carotid artery rupture (0%)
- D. Cavernous sinus thrombosis (2%)
- E. Facial nerve palsy (1%)
- F. Spinal epidural abscess (0%)

Omitted
Correct answer
B

80%
Answered correctly

01 sec
Time Spent

05/19/2020
Last Updated

Explanation

Ludwig angina is a **rapidly progressive cellulitis** of the **submandibular and sublingual** spaces. Most cases arise from contiguous (rather than lymphatic) spread of polymicrobial dental infections in the **mandibular molars**. This contiguous spread results in bilateral edema of the submandibular and sublingual spaces. As the submandibular area becomes tender and indurated, the floor of the mouth becomes elevated and

Ludwig angina is a **rapidly progressive cellulitis** of the **submandibular and sublingual** spaces. Most cases arise from contiguous (rather than lymphatic) spread of polymicrobial dental infections in the **mandibular molars**. This contiguous spread results in bilateral edema of the submandibular and sublingual spaces. As the submandibular area becomes tender and indurated, the floor of the mouth becomes elevated and displaces the tongue posteriorly, which may lead to **acute airway obstruction**. Additional clinical features of Ludwig angina include a neck that is often described as "woody" or "brawny" but has no associated lymphadenopathy.

As with other lesions that threaten the airway, patients with examination findings concerning for impending airway obstruction (eg, drooling, inability to lay flat, tripod positioning) should have their airway secured, regardless of current oxygen saturation. This is because oxygen saturation is often maintained until very rapid decompensation (within minutes). Therefore, these patients require continued assessment and, if needed, intervention to secure the airway (eg, nasotracheal intubation, awake tracheostomy).

(Choice A) Infection within the retropharyngeal space can present with dysphagia, hoarseness, and shortness of breath; however, this is due to edema in the posterior pharyngeal wall rather than displacement of the tongue. It is most likely to extend through the alar fascia into the "danger space", which can then progress into the posterior mediastinum and result in acute necrotizing mediastinitis.

(Choice C) Carotid artery rupture occurs when the vasa vasorum supplying the carotid is injured; it is most often a complication of head and neck cancer (eg, tumor invasion, tissue removal) and is not typically associated with deep neck space infection.

(Choice D) Infections originating in the maxillary space, not the mandibular space (as seen in this patient), can spread to the infratemporal space and orbit and progress to cavernous sinus thrombosis.

(Choice E) Acute otitis media can spread throughout the temporal bone and cause facial nerve palsy due to inflammation of the nerve as it travels through the tympanic and mastoid portions of the temporal bone. Submandibular space infections do not typically cause facial nerve palsy.

(Choice F) Deep neck space infections are prevented from spread into the epidural space by the vertebral column, posterior longitudinal ligament, and dura.

Educational objective:
Ludwig angina is a rapidly progressive cellulitis of the submandibular and sublingual spaces. Airway obstruction can occur due to displacement of the tongue posteriorly.

References

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Exhibit Display

Tripod position

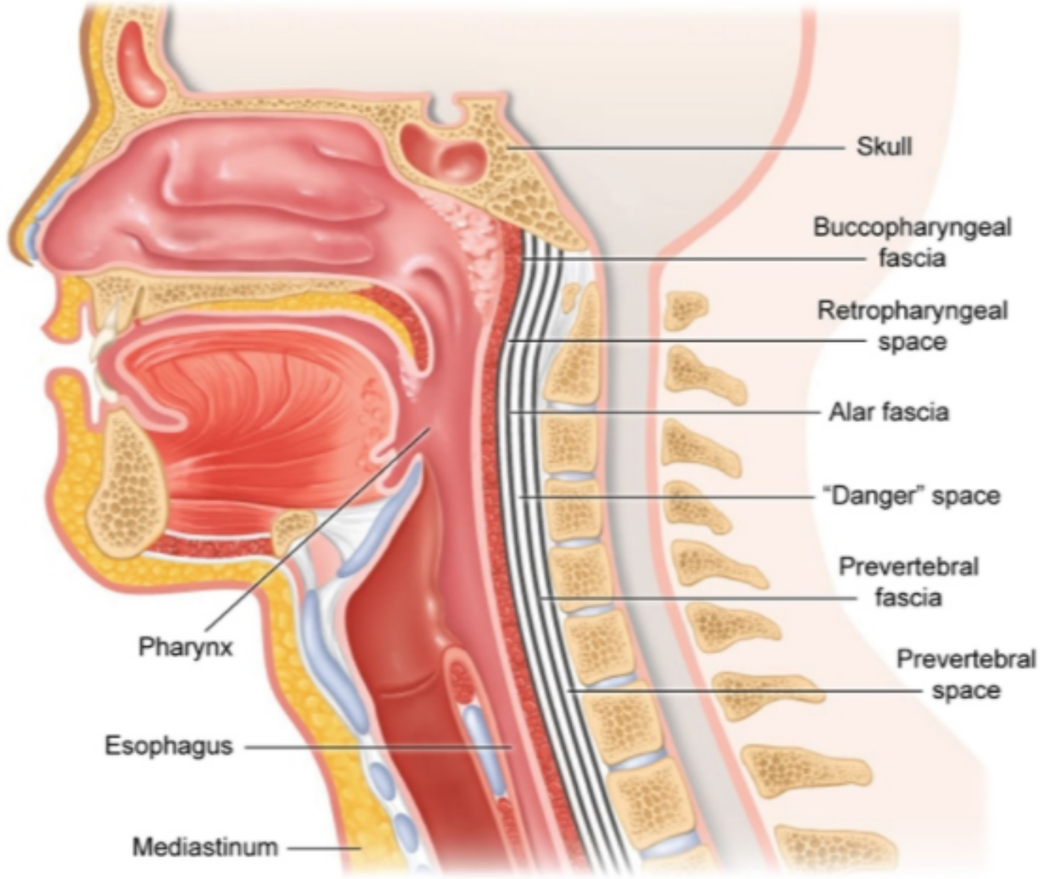


Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

References

Exhibit Display

Deep neck space anatomy



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

References

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 23-year-old man is brought to the emergency department after a motor vehicle collision. The patient was found unresponsive at the scene and intubated by the paramedics, who also administered 2 L of normal saline. He was the unrestrained driver. Upon arrival, blood pressure is 72/54 mm Hg, and pulse is 120/min. The patient responds to strong vocal and tactile stimuli by opening his eyes. Pupils are equal and reactive to light. Neck veins are distended. There are multiple bruises involving the anterior chest and upper abdomen. Chest x-ray reveals a small, left-sided pleural effusion and normal cardiac contours. Which of the following is the most likely diagnosis?

A. Aortic rupture
B. Bronchial rupture
C. Cardiac tamponade
D. Esophageal rupture
E. Lung contusion

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 23-year-old man is brought to the emergency department after a motor vehicle collision. The patient was found unresponsive at the scene and intubated by the paramedics, who also administered 2 L of normal saline. He was the unrestrained driver. Upon arrival, blood pressure is 72/54 mm Hg, and pulse is 120/min. The patient responds to strong vocal and tactile stimuli by opening his eyes. Pupils are equal and reactive to light. Neck veins are distended. There are multiple bruises involving the anterior chest and upper abdomen. Chest x-ray reveals a small, left-sided pleural effusion and normal cardiac contours. Which of the following is the most likely diagnosis?

- A. Aortic rupture (18%)
- B. Bronchial rupture (3%)
- ✓ C. Cardiac tamponade (60%)
- D. Esophageal rupture (3%)
- E. Lung contusion (14%)

Omitted
Correct answer
C

60%
Answered correctly

02 secs
Time Spent

05/24/2020
Last Updated

Explanation

Characteristics of cardiac tamponade		
Rapidity of fluid accumulation	**Acute**	**Subacute**
	Minutes to hours	Days to weeks

Characteristics of cardiac tamponade		
Rapidity of fluid accumulation	**Acute**	**Subacute**
	Minutes to hours	Days to weeks
Clinical signs	Beck triad: hypotension, JVD, muffled heart sounds Pulsus paradoxus (>10 mm Hg decrease in SBP with inspiration)	
Effusion volume	100-200 mL	1-2 L
Chest x-ray findings	Normal cardiac silhouette	Enlarged, globular cardiac silhouette

JVD = jugular venous distension; **SBP** = systolic blood pressure.

This patient with refractory **hypotension**, tachycardia, and **jugular venous distension** likely has **acute cardiac tamponade** (due to blunt cardiac injury from the collision). Cardiac tamponade is classified as acute or subacute based on the rate and volume of pericardial fluid accumulation.

Subacute tamponade typically develops from chronic processes that cause the slow accumulation of pericardial fluid (eg, malignancy, renal failure), giving the pericardium time to progressively stretch. The pericardium may accommodate 1-2 L of fluid before intrapericardial pressure rises and compromises cardiac function. This large quantity of pericardial fluid causes the classic globular cardiac silhouette on x-ray.

In contrast, acute tamponade occurs due to **rapid fluid accumulation** (eg, accumulation of blood due to blunt cardiac injury in this patient). Because the stiff pericardium does not have time to adapt, a **small amount of pericardial fluid** (eg, 100-200 mL) can dramatically increase intrapericardial pressure without causing cardiomegaly on x-ray (typically seen with >200 mL). Therefore, acute tamponade is associated with **normal cardiac contours**, as in this patient.

On physical examination, patients may have hypotension with elevated jugular venous pressure (obstructive shock due to the pericardial fluid preventing adequate cardiac contraction) as well as muffled heart sounds (Beck triad, only seen in a minority of patients). This patient's small, left-sided pleural effusion may be due to blood leaking from the pericardium (eg, through a small tear) or a concomitant injury (eg, lacerated lung parenchyma).

(Choice A) Aortic rupture is often immediately fatal. In rare instances, aortic rupture with bleeding into the left pleural space that has been

JVD = jugular venous distension; SBP = systolic blood pressure.

This patient with refractory **hypotension**, tachycardia, and **jugular venous distension** likely has **acute cardiac tamponade** (due to blunt cardiac injury from the collision). Cardiac tamponade is classified as acute or subacute based on the rate and volume of pericardial fluid accumulation.

Subacute tamponade typically develops from chronic processes that cause the slow accumulation of pericardial fluid (eg, malignancy, renal failure), giving the pericardium time to progressively stretch. The pericardium may accommodate 1-2 L of fluid before intrapericardial pressure rises and compromises cardiac function. This large quantity of pericardial fluid causes the classic globular cardiac silhouette on x-ray.

In contrast, acute tamponade occurs due to **rapid fluid accumulation** (eg, accumulation of blood due to blunt cardiac injury in this patient). Because the stiff pericardium does not have time to adapt, a **small amount of pericardial fluid** (eg, 100-200 mL) can dramatically increase intrapericardial pressure without causing cardiomegaly on x-ray (typically seen with >200 mL). Therefore, acute tamponade is associated with **normal cardiac contours**, as in this patient.

On physical examination, patients may have hypotension with elevated jugular venous pressure (obstructive shock due to the pericardial fluid preventing adequate cardiac contraction) as well as muffled heart sounds (Beck triad, only seen in a minority of patients). This patient's small, left-sided pleural effusion may be due to blood leaking from the pericardium (eg, through a small tear) or a concomitant injury (eg, lacerated lung parenchyma).

(Choice A) Aortic rupture is often immediately fatal. In rare instances, aortic rupture with bleeding into the left pleural space that has been contained (eg, by a hematoma) can present with left-sided pleural effusion and hypotension. However, it would cause hypovolemic (rather than obstructive) hypotension with flat (rather than distended) neck veins.

(Choice B) Traumatic bronchial rupture (air leaking from the tracheobronchial tree into the pleural space) can cause hypotension and jugular venous distension. However, this typically occurs with massive extrapulmonary air leakage, which would be associated with tension pneumothorax, pneumomediastinum, and subcutaneous emphysema (not seen on this patient's x-ray).

(Choice D) Esophageal rupture can allow efflux of gastrointestinal contents into the pleural space (causing pleural effusion) and mediastinum (causing mediastinitis, a systemic inflammatory response, and vasodilatory hypotension). However, flat (rather than distended) neck veins would be expected due to peripheral vasodilation.

(Choice E) Lung contusion that injures the lung parenchyma and visceral pleura can bleed into the pleural space, causing left-sided pleural

parenchyma).

(Choice A) Aortic rupture is often immediately fatal. In rare instances, aortic rupture with bleeding into the left pleural space that has been contained (eg, by a hematoma) can present with left-sided pleural effusion and hypotension. However, it would cause hypovolemic (rather than obstructive) hypotension with flat (rather than distended) neck veins.

(Choice B) Traumatic bronchial rupture (air leaking from the tracheobronchial tree into the pleural space) can cause hypotension and jugular venous distension. However, this typically occurs with massive extrapulmonary air leakage, which would be associated with tension pneumothorax, pneumomediastinum, and subcutaneous emphysema (not seen on this patient's x-ray).

(Choice D) Esophageal rupture can allow efflux of gastrointestinal contents into the pleural space (causing pleural effusion) and mediastinum (causing mediastinitis, a systemic inflammatory response, and vasodilatory hypotension). However, flat (rather than distended) neck veins would be expected due to peripheral vasodilation.

(Choice E) Lung contusion that injures the lung parenchyma and visceral pleura can bleed into the pleural space, causing left-sided pleural effusion. However, lung contusion with bleeding sufficient to cause hypotension (from hypovolemia) would be associated with flat (rather than distended) neck veins.

Educational objective:
Acute cardiac tamponade is due to rapid accumulation of a small amount of fluid within a stiff pericardium, causing a sudden rise in intrapericardial pressure. Unlike subacute tamponade, the cardiac silhouette can be normal on chest x-ray.

References

- Blunt cardiac trauma: a review of the current knowledge and management.
- Blunt cardiac trauma review.

Surgery	Cardiovascular System	Cardiac tamponade
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

	Acute	Subacute
Rapidity of fluid accumulation		

Exhibit Display



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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 54-year-old man comes to the emergency department due to shortness of breath. Over the past 2 weeks he has had progressively labored breathing that now occurs even at rest. He has had no chest pain, cough, fevers, night sweats, nausea, vomiting, or weight changes. The patient does note frequent "attacks" of epigastric pain for the past 10 years, which occur twice a month and last a few days at a time. Medical history is significant for alcohol withdrawal seizures; the patient has consumed 7 or 8 beers a day for the past 20 years. Temperature is 37.7 C (98.8 F), heart rate is 95/min, and respirations are 23/min; oxygen saturation is 92% on 4 L oxygen by nasal cannula. Physical examination shows decreased breath sounds on the left side along with dullness to percussion. The abdomen is tender to palpation in the epigastrium without rebound or guarding. Extremities are warm and well perfused without edema or clubbing. Chest x-ray reveals a large, left-sided pleural effusion. Thoracentesis results in removal of 1.5 L of fluid. A sample is sent for analysis, revealing the following:

Pleural fluid

Total protein	5.9 g/dL
Lactate dehydrogenase	270 U/L
pH	7.37
Amylase, fluid	2510 U/L

Blood, plasma

Total protein	7.4 mg/dL
Lactate dehydrogenase	320 U/L

What is the most likely diagnosis in this patient?

A. Alcohol cirrhosis
B. Alcohol-induced dilated cardiomyopathy
C. Empyema

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Pleural fluid

Total protein	5.9 g/dL
Lactate dehydrogenase	270 U/L
pH	7.37
Amylase, fluid	2510 U/L

Blood, plasma

Total protein	7.4 mg/dL
Lactate dehydrogenase	320 U/L

What is the most likely diagnosis in this patient?

A. Alcohol cirrhosis
B. Alcohol-induced dilated cardiomyopathy
C. Empyema
D. Esophageal perforation
E. Pancreatic fistula
F. Pulmonary tuberculosis

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Pleural fluid

Total protein	5.9 g/dL
Lactate dehydrogenase	270 U/L
pH	7.37
Amylase, fluid	2510 U/L

Blood, plasma

Total protein	7.4 mg/dL
Lactate dehydrogenase	320 U/L

What is the most likely diagnosis in this patient?

- A. Alcohol cirrhosis (6%)
- B. Alcohol-induced dilated cardiomyopathy (3%)
- C. Empyema (12%)
- D. Esophageal perforation (20%)
- ✓ E. Pancreatic fistula (57%)
- F. Pulmonary tuberculosis (0%)

Omitted
Correct answer

57%
Answered correctly

04 secs
Time Spent

02/10/2020
Last Updated

Exudative & transudative pleural effusions		
	Exudate	**Transudate**
Light criteria	Pleural protein/serum protein >0.5 **OR** Pleural LDH/serum LDH >0.6 **OR** Pleural LDH >2/3 upper limit of normal of serum LDH	Exudate criteria not met
Pathophysiology	Inflammation	Hydrostatic or oncotic pressure
Common causes	• Infection (eg, TB, pneumonia) • Malignancy • Connective tissue disease • Pulmonary embolism • Pancreatitis • Post-CABG	• Cirrhosis (hepatic hydrothorax) • Nephrotic syndrome • Heart failure • Constrictive pericarditis

CABG = coronary artery bypass grafting; **LDH** = lactate dehydrogenase; **TB** = tuberculosis.

This patient has an amylase-rich, exudative pleural effusion. Given his history of heavy alcohol use and recurrent epigastric abdominal pain, this presentation suggests chronic pancreatitis resulting in a **pancreaticopleural fistula** (PPF).

Pancreatic fistulas are caused by a disruption of the pancreatic ducts, resulting in leakage of pancreatic digestive enzymes. They are most commonly due to acute or **chronic pancreatitis** and typically result in the formation of an internal fistula (ie, communication with hollow viscera, pleural/peritoneal cavities). Iatrogenic fistulas can occur after percutaneous drainage of pancreatic cysts or abscesses and typically result in external fistulas (ie, communication with the skin).

Fistulas involving the pleural cavity enable pancreatic fluid to enter the pleural space. The resultant **pleural effusion** is **exudative** by Light criteria

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

This patient has an amylase-rich, exudative pleural effusion. Given his history of heavy alcohol use and recurrent epigastric abdominal pain, this presentation suggests chronic pancreatitis resulting in a **pancreaticopleural fistula** (PPF).

Pancreatic fistulas are caused by a disruption of the pancreatic ducts, resulting in leakage of pancreatic digestive enzymes. They are most commonly due to acute or **chronic pancreatitis** and typically result in the formation of an internal fistula (ie, communication with hollow viscera, pleural/peritoneal cavities). Iatrogenic fistulas can occur after percutaneous drainage of pancreatic cysts or abscesses and typically result in external fistulas (ie, communication with the skin).

Fistulas involving the pleural cavity enable pancreatic fluid to enter the pleural space. The resultant **pleural effusion** is **exudative** by Light criteria and **amylase-rich** (ie, pleural fluid amylase exceeding upper limit of normal for serum amylase or a pleural-fluid-to-serum-amylase ratio >1). The pH is typically 7.3-7.5. Manifestations include cough, dyspnea, dysphagia, and chest pain; however, some patients can be asymptomatic. Examination demonstrates decreased breath sounds and dullness to percussion of the affected lung.

PPFs tend to recur after thoracentesis. Management includes **bowel rest** to avoid pancreatic stimulation, enabling the PPF to close. Endoscopic retrograde cholangiopancreatography with sphincterotomy and/or stent placement may be required to promote drainage of pancreatic fluid through the ampulla of Vater instead of the fistula. Refractory cases require percutaneous drainage or surgery.

(Choice A) In patients with cirrhosis, a unilateral pleural effusion (eg, hepatic hydrothorax) can develop but is generally right-sided and transudative and would not exhibit high amylase levels.

(Choice B) Heavy alcohol use can result in a dilated cardiomyopathy, and volume overload would typically result in bilateral, transudative pleural effusions.

(Choices C and F) Empyema and pulmonary tuberculosis are exudative processes; however, both typically result in a low pH (<7.30) and a markedly elevated amylase is unexpected. Tuberculous effusions also typically demonstrate an elevated adenosine deaminase level.

(Choice D) An esophageal rupture (Boerhaave syndrome) results in an amylase-rich exudative pleural effusion; however, the pleural fluid pH is typically very low (<6), and undigested food may be present. In addition, Boerhaave syndrome typically occurs in the setting of severe vomiting and chest pain is expected.

Educational objective:
A pancreaticopleural fistula (between the pancreatic duct and the pleural space) resulting in an amylase-rich exudative pleural effusion occurs

Examination demonstrates decreased breath sounds and dullness to percussion of the affected lung.

PPFs tend to recur after thoracentesis. Management includes **bowel rest** to avoid pancreatic stimulation, enabling the PPF to close. Endoscopic retrograde cholangiopancreatography with sphincterotomy and/or stent placement may be required to promote drainage of pancreatic fluid through the ampulla of Vater instead of the fistula. Refractory cases require percutaneous drainage or surgery.

(Choice A) In patients with cirrhosis, a unilateral pleural effusion (eg, hepatic hydrothorax) can develop but is generally right-sided and transudative and would not exhibit high amylase levels.

(Choice B) Heavy alcohol use can result in a dilated cardiomyopathy, and volume overload would typically result in bilateral, transudative pleural effusions.

(Choices C and F) Empyema and pulmonary tuberculosis are exudative processes; however, both typically result in a low pH (<7.30) and a markedly elevated amylase is unexpected. Tuberculous effusions also typically demonstrate an elevated adenosine deaminase level.

(Choice D) An esophageal rupture (Boerhaave syndrome) results in an amylase-rich exudative pleural effusion; however, the pleural fluid pH is typically very low (<6), and undigested food may be present. In addition, Boerhaave syndrome typically occurs in the setting of severe vomiting and chest pain is expected.

Educational objective:
A pancreaticopleural fistula (between the pancreatic duct and the pleural space) resulting in an amylase-rich exudative pleural effusion occurs most commonly as a result of acute or chronic pancreatitis. Management includes bowel rest to promote fistula closure; endoscopic retrograde cholangiopancreatography may be required.

References

- Pancreaticopleural fistula: a review.

Surgery	Gastrointestinal & Nutrition	Chronic pancreatitis
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 68-year-old man comes to the office for follow-up of an abnormal finding on abdominal CT scan. Two weeks ago, the patient was seen in the emergency department for left lower quadrant abdominal pain. CT scan revealed acute sigmoid diverticulitis, which improved with oral antibiotics, as well as a cyst in the head of the pancreas. The patient has no history of pancreatic diseases and reports no epigastric pain, diarrhea, or weight loss. He used to drink alcohol heavily but stopped several years ago and does not smoke cigarettes. Family history is unremarkable. Vital signs are within normal limits. Physical examination shows no abnormalities. MRI of the abdomen confirms a 4.6-cm, multilocular cyst in the head of the pancreas with thickened walls. The main pancreatic duct is mildly dilated. Serum amylase, lipase, and liver chemistry studies are within normal limits. Which of the following is the next best step in management of this patient?

A. Endoscopic ultrasound–guided biopsy
B. Reassurance and no further intervention
C. Screening for intracranial aneurysms
D. Serologic testing for intestinal helminths
E. Surgical drainage of the cyst

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 68-year-old man comes to the office for follow-up of an abnormal finding on abdominal CT scan. Two weeks ago, the patient was seen in the emergency department for left lower quadrant abdominal pain. CT scan revealed acute sigmoid diverticulitis, which improved with oral antibiotics, as well as a cyst in the head of the pancreas. The patient has no history of pancreatic diseases and reports no epigastric pain, diarrhea, or weight loss. He used to drink alcohol heavily but stopped several years ago and does not smoke cigarettes. Family history is unremarkable. Vital signs are within normal limits. Physical examination shows no abnormalities. MRI of the abdomen confirms a 4.6-cm, multilocular cyst in the head of the pancreas with thickened walls. The main pancreatic duct is mildly dilated. Serum amylase, lipase, and liver chemistry studies are within normal limits. Which of the following is the next best step in management of this patient?

- A. Endoscopic ultrasound–guided biopsy (37%)
- B. Reassurance and no further intervention (32%)
- C. Screening for intracranial aneurysms (2%)
- D. Serologic testing for intestinal helminths (1%)
- E. Surgical drainage of the cyst (25%)

Omitted
Correct answer
A

37%
Answered correctly

02 secs
Time Spent

02/11/2020
Last Updated

Explanation

Pancreatic cysts are common incidental findings in the aging population, with an estimated incidence of 40% in individuals age >70. The risk of malignancy in any given cyst is quite low (~0.01%), and many can be managed conservatively with surveillance imaging.

However, some pancreatic cysts carry a risk for **malignant transformation**. Because cyst resection has significant risks of morbidity and

Pancreatic cysts are common incidental findings in the aging population, with an estimated incidence of 40% in individuals age >70. The risk of malignancy in any given cyst is quite low (~0.01%), and many can be managed conservatively with surveillance imaging.

However, some pancreatic cysts carry a risk for **malignant transformation**. Because cyst resection has significant risks of morbidity and mortality, the goal of management is to identify lesions that are at **high risk** for malignancy. Several radiographic features are associated with higher risk for malignancy, including:

- **Large size** (≥3 cm)
- Solid components or calcifications
- **Main pancreatic duct involvement** (ie, ductal dilation)
- **Thickened or irregular cyst wall**

This patient's pancreatic cyst has several high-risk features (ie, large size, main ductal dilation, thickened walls) and requires further evaluation to rule out malignancy. **Endoscopic ultrasound (EUS)–guided biopsy** is a minimally invasive approach to tissue sampling; however, surgical resection (without prior biopsy) may be considered for very high-risk lesions.

(Choices B and E) Unlike true pancreatic cysts, an uncomplicated pancreatic pseudocyst (eg, rounded, well-circumscribed fluid collection formed by pancreatic necrosis in pancreatitis) has a very low risk of malignancy and usually does not require further intervention. However, symptomatic (eg, abdominal pain) or rapidly enlarging pseudocysts may require endoscopic drainage. This patient has a true cyst with high-risk features concerning for malignancy and requires further evaluation with an EUS-guided biopsy.

(Choice C) Screening for intracranial aneurysms is recommended for patients with autosomal dominant polycystic kidney disease (ADPKD). Although ADPKD can be associated with pancreatic cysts, it typically presents with hematuria, flank pain, hypertension, and chronic kidney disease earlier in life. Additionally, numerous renal cysts would likely be visible on CT scan.

(Choice D) Serologic testing can help diagnose amebiasis due to *Entamoeba histolytica*. Although amebiasis can cause abdominal pain, it presents with diarrhea (bloody or nonbloody), fevers, weight loss, and liver abscesses (not pancreatic cysts).

Educational objective:
Most pancreatic cysts are benign and can be managed conservatively (eg, surveillance imaging); however, some carry a risk for malignant transformation. Cysts with high-risk features (large size, solid components or calcifications, main pancreatic duct involvement, thickened or irregular cyst wall) require further evaluation with endoscopic ultrasound–guided biopsy and possibly surgical resection.

- **Thickened or irregular cyst wall**

This patient's pancreatic cyst has several high-risk features (ie, large size, main ductal dilation, thickened walls) and requires further evaluation to rule out malignancy. **Endoscopic ultrasound (EUS)–guided biopsy** is a minimally invasive approach to tissue sampling; however, surgical resection (without prior biopsy) may be considered for very high-risk lesions.

(Choices B and E) Unlike true pancreatic cysts, an uncomplicated pancreatic pseudocyst (eg, rounded, well-circumscribed fluid collection formed by pancreatic necrosis in pancreatitis) has a very low risk of malignancy and usually does not require further intervention. However, symptomatic (eg, abdominal pain) or rapidly enlarging pseudocysts may require endoscopic drainage. This patient has a true cyst with high-risk features concerning for malignancy and requires further evaluation with an EUS-guided biopsy.

(Choice C) Screening for intracranial aneurysms is recommended for patients with autosomal dominant polycystic kidney disease (ADPKD). Although ADPKD can be associated with pancreatic cysts, it typically presents with hematuria, flank pain, hypertension, and chronic kidney disease earlier in life. Additionally, numerous renal cysts would likely be visible on CT scan.

(Choice D) Serologic testing can help diagnose amebiasis due to *Entamoeba histolytica*. Although amebiasis can cause abdominal pain, it presents with diarrhea (bloody or nonbloody), fevers, weight loss, and liver abscesses (not pancreatic cysts).

Educational objective:
Most pancreatic cysts are benign and can be managed conservatively (eg, surveillance imaging); however, some carry a risk for malignant transformation. Cysts with high-risk features (large size, solid components or calcifications, main pancreatic duct involvement, thickened or irregular cyst wall) require further evaluation with endoscopic ultrasound–guided biopsy and possibly surgical resection.

References

- ACG clinical guideline: diagnosis and management of pancreatic cysts.
- Revisions of international consensus Fukuoka guidelines for the management of IPMN of the pancreas.

Surgery	Gastrointestinal & Nutrition	Pancreatic cancer
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 11-year-old girl is brought to the emergency department due to persistent vomiting. The first episode of emesis occurred 12 hours ago, and for the past 4 hours, the patient has been unable to keep any liquids down. She also has nausea and epigastric discomfort but no fever, abdominal distension, or diarrhea. The patient is a competitive gymnast. Yesterday, she fell and struck her abdomen hard on the balance beam during practice. Temperature is 36.7 C (98.1 F), blood pressure is 106/72 mm Hg, pulse is 110/min, and respirations are 18/min. On examination, mucous membranes are dry. Lung and heart sounds are normal. The abdomen is scaphoid with linear bruising across the epigastrium. On palpation, there is epigastric tenderness without guarding, rigidity, or rebound tenderness. Upright chest and abdominal x-rays are normal, with no free air under the diaphragm. Focused assessment with sonography for trauma reveals no intraperitoneal free fluid or air. Which of the following is the best next step in management of this patient?

A. Antiemetics and observation only
B. CT scan of the abdomen
C. Diagnostic peritoneal lavage
D. Exploratory laparotomy
E. Gallbladder ultrasonography

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 11-year-old girl is brought to the emergency department due to persistent vomiting. The first episode of emesis occurred 12 hours ago, and for the past 4 hours, the patient has been unable to keep any liquids down. She also has nausea and epigastric discomfort but no fever, abdominal distension, or diarrhea. The patient is a competitive gymnast. Yesterday, she fell and struck her abdomen hard on the balance beam during practice. Temperature is 36.7 C (98.1 F), blood pressure is 106/72 mm Hg, pulse is 110/min, and respirations are 18/min. On examination, mucous membranes are dry. Lung and heart sounds are normal. The abdomen is scaphoid with linear bruising across the epigastrium. On palpation, there is epigastric tenderness without guarding, rigidity, or rebound tenderness. Upright chest and abdominal x-rays are normal, with no free air under the diaphragm. Focused assessment with sonography for trauma reveals no intraperitoneal free fluid or air. Which of the following is the best next step in management of this patient?

- A. Antiemetics and observation only (15%)
- ✓ B. CT scan of the abdomen (77%)
- C. Diagnostic peritoneal lavage (3%)
- D. Exploratory laparotomy (3%)
- E. Gallbladder ultrasonography (0%)

Omitted
Correct answer
B

77%
Answered correctly

02 secs
Time Spent

03/04/2020
Last Updated

Explanation

This patient has epigastric discomfort, nausea, and worsening emesis approximately 1 day after blunt abdominal trauma (BAT) (eg, balance beam impact). This presentation is concerning for **duodenal hematoma** (DH) and is best evaluated with abdominal CT scan.

This patient has epigastric discomfort, nausea, and worsening emesis approximately 1 day after blunt abdominal trauma (BAT) (eg, balance beam impact). This presentation is concerning for **duodenal hematoma** (DH) and is best evaluated with abdominal CT scan.

Rapid **compression of the duodenum** against the vertebral column during BAT can injure blood vessels between the submucosal and the muscularis layers, causing bleeding and **hematoma formation**. Continued **hematoma expansion** over the subsequent 24-48 hours can lead to **progressive obstruction** of the duodenal lumen, as in this patient with worsening emesis who can no longer tolerate liquids (eg, complete obstruction).

CT scan of the abdomen can confirm the diagnosis and visualize the extent of the hematoma, which typically appears as a homogenous density (ie, coagulated blood) within the C-shaped duodenum. Once confirmed, DHs typically are managed with bowel rest, nasogastric decompression, and parenteral nutrition and are followed with serial CT scans or duodenal ultrasonography. Most DHs resolve within a few weeks with nonoperative management.

(Choice A) Although this patient should receive antiemetics, her abdominal pain and worsening emesis with an inability to tolerate fluids are concerning for intraabdominal injury following BAT and warrant further workup (eg, imaging).

(Choice C) The role of diagnostic peritoneal lavage has been largely reduced to evaluating for intraabdominal hemorrhage in hemodynamically unstable patients with questionable bedside ultrasound results. This patient is hemodynamically stable and can undergo definitive imaging with CT scan.

(Choice D) Exploratory laparotomy is indicated when patients with BAT have peritonitis (eg, rigidity, rebound tenderness) or hemodynamic instability (eg, systolic blood pressure <90 mm Hg) with evidence of intraabdominal hemorrhage (eg, intraperitoneal free fluid). This patient has none of these indications.

(Choice E) Gallbladder ultrasonography is commonly used to evaluate for suspected cholecystitis, which can cause epigastric discomfort and emesis but typically also causes fever and right upper quadrant tenderness. Isolated gallbladder injury from BAT is extremely rare, given the gallbladder's protected location under the liver's edge.

Educational objective:
Rapid compression of the duodenum against the vertebral column during blunt abdominal trauma may result in a duodenal hematoma. Hematoma expansion can progressively obstruct the duodenal lumen, causing a delayed (24-48 hr) presentation of worsening emesis. CT scan

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

and parenteral nutrition and are followed with serial CT scans or duodenal ultrasonography. Most DHs resolve within a few weeks with nonoperative management.

(Choice A) Although this patient should receive antiemetics, her abdominal pain and worsening emesis with an inability to tolerate fluids are concerning for intraabdominal injury following BAT and warrant further workup (eg, imaging).

(Choice C) The role of diagnostic peritoneal lavage has been largely reduced to evaluating for intraabdominal hemorrhage in hemodynamically unstable patients with questionable bedside ultrasound results. This patient is hemodynamically stable and can undergo definitive imaging with CT scan.

(Choice D) Exploratory laparotomy is indicated when patients with BAT have peritonitis (eg, rigidity, rebound tenderness) or hemodynamic instability (eg, systolic blood pressure <90 mm Hg) with evidence of intraabdominal hemorrhage (eg, intraperitoneal free fluid). This patient has none of these indications.

(Choice E) Gallbladder ultrasonography is commonly used to evaluate for suspected cholecystitis, which can cause epigastric discomfort and emesis but typically also causes fever and right upper quadrant tenderness. Isolated gallbladder injury from BAT is extremely rare, given the gallbladder's protected location under the liver's edge.

Educational objective:
Rapid compression of the duodenum against the vertebral column during blunt abdominal trauma may result in a duodenal hematoma. Hematoma expansion can progressively obstruct the duodenal lumen, causing a delayed (24-48 hr) presentation of worsening emesis. CT scan confirms the diagnosis.

References

- Pancreatic and duodenal trauma in children.
- Intramural duodenal hematoma: clinical course and imaging findings.

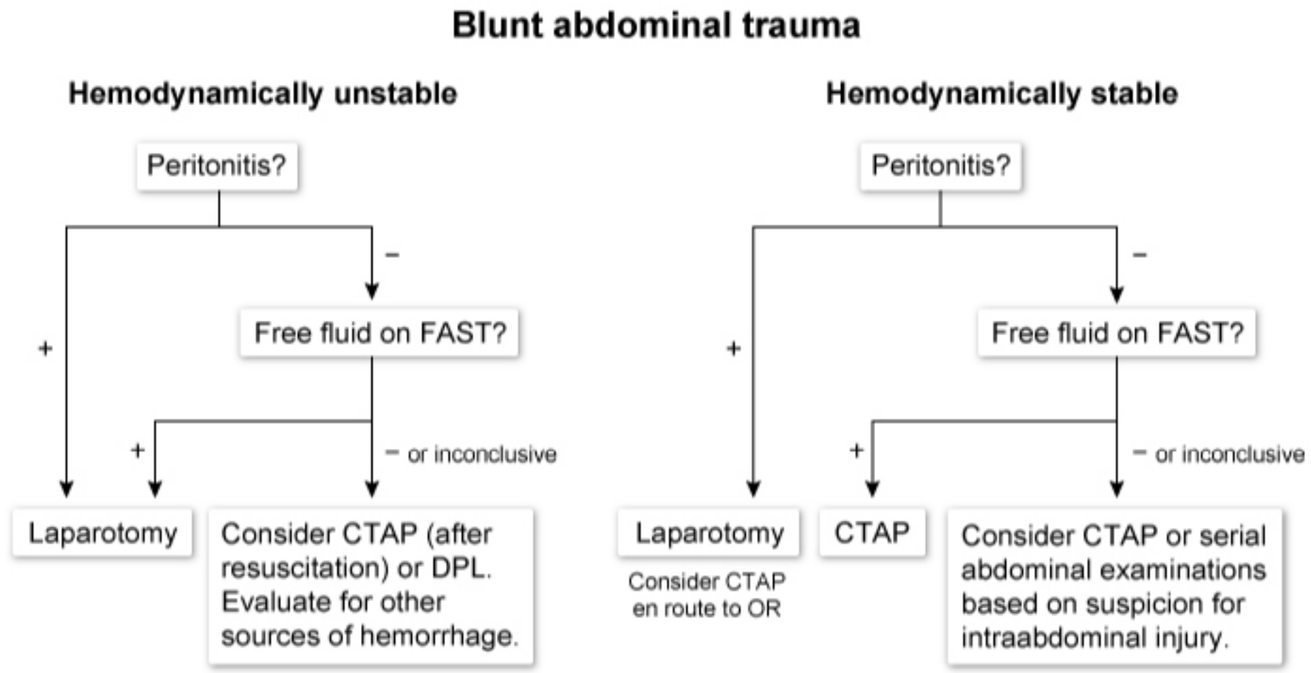
Surgery	Gastrointestinal & Nutrition	Blunt abdominal trauma
Subject	System	Topic

Copyright © UWorld. All rights reserved.

and parenteral nutrition and are followed with serial CT scans or duodenal ultrasonography. Most DHs resolve within a few weeks with nonoperative management.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Exhibit Display



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

©UWorld

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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 65-year-old man is found to have a lung nodule on chest x-ray performed for evaluation of a dry cough. The cough has since resolved, and he has no other symptoms. The patient has a 30-pack-year smoking history but quit 2 years ago. He has no family history of cancer. CT scan of the chest reveals a 2-cm, peripheral, round lesion in the right lower lung lobe that is surrounded by lung parenchyma. The borders are irregular and no calcification is present. There are no other lung lesions or enlarged lymph nodes. Which of the following is the best next step in management of this patient's lung lesion?

A. Check tuberculin skin testing
B. Obtain sputum for cytology
C. Reassure with no additional intervention
D. Recommend surgical excision
E. Repeat CT scan of the chest in 3 months

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 65-year-old man is found to have a lung nodule on chest x-ray performed for evaluation of a dry cough. The cough has since resolved, and he has no other symptoms. The patient has a 30-pack-year smoking history but quit 2 years ago. He has no family history of cancer. CT scan of the chest reveals a 2-cm, peripheral, round lesion in the right lower lung lobe that is surrounded by lung parenchyma. The borders are irregular and no calcification is present. There are no other lung lesions or enlarged lymph nodes. Which of the following is the best next step in management of this patient's lung lesion?

A. Check tuberculin skin testing (3%)
B. Obtain sputum for cytology (5%)
C. Reassure with no additional intervention (2%)
✓ D. Recommend surgical excision (55%)
E. Repeat CT scan of the chest in 3 months (33%)

Omitted
Correct answer
D

55%
Answered correctly

02 secs
Time Spent

06/21/2020
Last Updated

Explanation

Solitary pulmonary nodules	
Factors increasing	• Large size* • Advanced patient age • Female sex

Solitary pulmonary nodules	
Factors increasing malignant probability	• Large size* • Advanced patient age • Female sex • Active or previous smoking • Family or personal history of lung cancer • Upper lobe location • Spiculated radiographic appearance

*Size >2 cm independently correlates with >50% malignant probability.

A **solitary pulmonary nodule** (SPN) is defined by the following features:

- Rounded opacity
- ≤3 cm in diameter (>3 cm is considered a "mass")
- Surrounded by pulmonary parenchyma
- No associated lymph node enlargement

The size of an SPN strongly correlates with the chances of it being malignant. Nodules <0.6 cm are unlikely to be malignant and generally do not require follow-up; however, **nodules >0.8 cm** require **additional management or surveillance**.

In addition to size, other factors that influence the probability of an SPN being malignant include patient age, sex, **smoking history**, family history, location of the nodule in the lung, and radiographic appearance of the nodule (eg, regular versus **irregular borders**). Nodules >0.8 cm that are **intermediate or high probability for malignancy** (ie, ≥5% risk) based on these factors require tissue diagnosis with **biopsy or surgical excision**. This relatively large SPN with irregular borders in a 65-year-old patient with a significant smoking history has high malignant probability and should be biopsied or surgically excised.

For patients in whom the need for tissue diagnosis is unclear, positron emission tomography (PET) scan can be helpful. Nodules demonstrating high metabolic activity on PET scan are more likely malignant than benign and warrant biopsy or surgical excision.

(Choice A) Infectious granulomas (eg, tuberculosis, histoplasmosis, atypical mycobacteria) are the most common cause of benign pulmonary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

The size of an SPN strongly correlates with the chances of it being malignant. Nodules <0.6 cm are unlikely to be malignant and generally do not require follow-up; however, **nodules >0.8 cm** require **additional management or surveillance**.

In addition to size, other factors that influence the probability of an SPN being malignant include patient age, sex, **smoking history**, family history, location of the nodule in the lung, and radiographic appearance of the nodule (eg, regular versus **irregular borders**). Nodules >0.8 cm that are **intermediate or high probability for malignancy** (ie, ≥5% risk) based on these factors require tissue diagnosis with **biopsy or surgical excision**. This relatively large SPN with irregular borders in a 65-year-old patient with a significant smoking history has high malignant probability and should be biopsied or surgically excised.

For patients in whom the need for tissue diagnosis is unclear, positron emission tomography (PET) scan can be helpful. Nodules demonstrating high metabolic activity on PET scan are more likely malignant than benign and warrant biopsy or surgical excision.

(Choice A) Infectious granulomas (eg, tuberculosis, histoplasmosis, atypical mycobacteria) are the most common cause of benign pulmonary nodules; however, the nodules are typically multiple rather than solitary and, in the absence of active (symptomatic) disease (eg, fever, cough, weight loss), are relatively small (ie, <1 cm).

(Choice B) Sputum cytology has low sensitivity for detecting malignancy and is generally not helpful in evaluating an SPN.

(Choice C) Reassurance alone is not appropriate, as this SPN has a high chance of being malignant.

(Choice E) Surveillance with repeat CT scan in 3 months is appropriate for nodules >0.8 cm that are low probability for malignancy (eg, 1 cm nodule in a 50-year-old man with no smoking history). However, expedient tissue diagnosis is needed for the relatively large nodule in this 65-year-old patient with a significant smoking history.

Educational objective:
Solitary pulmonary nodules <0.6 cm are unlikely to be malignant, whereas those >0.8 cm require additional management or surveillance. Nodules that are intermediate or high probability for malignancy (ie, ≥5% probability) based on clinical factors (eg, nodule size, patient age, smoking history) should be biopsied or surgically excised.

Surgery	Pulmonary & Critical Care	Lung nodule
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

An 80-year-old man is brought to the emergency department due to 2 days of fever, productive cough, and shortness of breath. The patient has a history of hypertension, coronary artery disease, and ascending aortic aneurysm with moderate aortic insufficiency. He has not been hospitalized or used antibiotics recently. The patient is an ex-smoker with a 30-pack-year history and has no drug allergies. Temperature is 38.4 C (101.1 F), blood pressure is 110/68 mm Hg, pulse is 102/min, and respirations are 20/min. Physical examination reveals right-sided lung crackles and a grade 2/4 early diastolic murmur. Leukocytes are 14,000/mm^3, and a chest x-ray shows infiltrates in the right upper lobe of the lung. Which of the following antibiotics should be avoided in this patient to prevent complications associated with his comorbid conditions?

A. Amoxicillin
B. Azithromycin
C. Ceftriaxone
D. Doxycycline
E. Levofloxacin

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

An 80-year-old man is brought to the emergency department due to 2 days of fever, productive cough, and shortness of breath. The patient has a history of hypertension, coronary artery disease, and ascending aortic aneurysm with moderate aortic insufficiency. He has not been hospitalized or used antibiotics recently. The patient is an ex-smoker with a 30-pack-year history and has no drug allergies. Temperature is 38.4 C (101.1 F), blood pressure is 110/68 mm Hg, pulse is 102/min, and respirations are 20/min. Physical examination reveals right-sided lung crackles and a grade 2/4 early diastolic murmur. Leukocytes are 14,000/mm^3, and a chest x-ray shows infiltrates in the right upper lobe of the lung. Which of the following antibiotics should be avoided in this patient to prevent complications associated with his comorbid conditions?

A. Amoxicillin (2%)
B. Azithromycin (23%)
C. Ceftriaxone (2%)
D. Doxycycline (17%)
✓ E. Levofloxacin (54%)

Omitted
Correct answer
E

54%
Answered correctly

02 secs
Time Spent

01/14/2020
Last Updated

Explanation

This patient with fever, cough, and a pulmonary infiltrate on chest x-ray most likely has community-acquired pneumonia (CAP). All of the antibiotics listed can play a part in the management of CAP. However, given this patient's aortic aneurysm, the use of **fluoroquinolones** (eg, levofloxacin, moxifloxacin, ciprofloxacin) is relatively contraindicated. Fluoroquinolones upregulate cell matrix metalloproteases, leading to **increased collagen degradation**; this mechanism is likely responsible for several associated **adverse effects**, including Achilles tendon rupture,

This patient with fever, cough, and a pulmonary infiltrate on chest x-ray most likely has community-acquired pneumonia (CAP). All of the antibiotics listed can play a part in the management of CAP. However, given this patient's aortic aneurysm, the use of **fluoroquinolones** (eg, levofloxacin, moxifloxacin, ciprofloxacin) is relatively contraindicated. Fluoroquinolones upregulate cell matrix metalloproteases, leading to **increased collagen degradation**; this mechanism is likely responsible for several associated **adverse effects**, including Achilles tendon rupture, retinal detachment, and aortic aneurysm rupture.

The increased risk of aortic aneurysm rupture with fluoroquinolones is small overall, but it warrants serious consideration due to the high morbidity and mortality of rupture. Hence, when possible, these drugs should be **avoided** in patients with known **aortic aneurysm** or substantial risk factors for aortic aneurysm (eg, Marfan syndrome, Ehlers-Danlos syndrome, advanced atherosclerotic disease, uncontrolled hypertension).

Other adverse effects of fluoroquinolones that are likely unrelated to collagen degradation include encephalopathy, peripheral neuropathy, and QT-interval prolongation.

(Choice A) Amoxicillin is sometimes used for outpatient treatment of CAP. Adverse effects include hypersensitivity reactions (eg, urticaria, acute interstitial nephritis) and nonallergic skin rash (eg, erythema multiforme).

(Choice B) Macrolides (eg, azithromycin, clarithromycin) can be used as monotherapy for outpatient treatment of CAP or can be combined with a beta-lactam antibiotic for inpatient treatment. Adverse effects include gastrointestinal disturbance (eg, nausea) and QT-interval prolongation.

(Choice C) Ceftriaxone is usually the beta-lactam of choice for inpatient treatment of CAP. Like most beta-lactams, ceftriaxone is associated with hypersensitivity reactions. It is also associated with cholestasis in some patients.

(Choice D) Doxycycline monotherapy is appropriate for outpatient treatment of CAP, and the drug is sometimes combined with a beta-lactam for inpatient treatment. Adverse effects include skin photosensitivity and medication-induced esophagitis.

Educational objective:
Fluoroquinolones (eg, levofloxacin) increase collagen degradation and are associated with adverse effects, including Achilles tendon rupture, retinal detachment, and aortic aneurysm rupture. When possible, fluoroquinolone use should be avoided in patients with a known aortic aneurysm or substantial risk factors for aortic aneurysm.

References

- Aortic dissection and aortic aneurysms associated with fluoroquinolones: a systematic review and meta-analysis

and mortality of rupture. Hence, when possible, these drugs should be **avoided** in patients with known **aortic aneurysm** or substantial risk factors for aortic aneurysm (eg, Marfan syndrome, Ehlers-Danlos syndrome, advanced atherosclerotic disease, uncontrolled hypertension).

Other adverse effects of fluoroquinolones that are likely unrelated to collagen degradation include encephalopathy, peripheral neuropathy, and QT-interval prolongation.

(Choice A) Amoxicillin is sometimes used for outpatient treatment of CAP. Adverse effects include hypersensitivity reactions (eg, urticaria, acute interstitial nephritis) and nonallergic skin rash (eg, erythema multiforme).

(Choice B) Macrolides (eg, azithromycin, clarithromycin) can be used as monotherapy for outpatient treatment of CAP or can be combined with a beta-lactam antibiotic for inpatient treatment. Adverse effects include gastrointestinal disturbance (eg, nausea) and QT-interval prolongation.

(Choice C) Ceftriaxone is usually the beta-lactam of choice for inpatient treatment of CAP. Like most beta-lactams, ceftriaxone is associated with hypersensitivity reactions. It is also associated with cholestasis in some patients.

(Choice D) Doxycycline monotherapy is appropriate for outpatient treatment of CAP, and the drug is sometimes combined with a beta-lactam for inpatient treatment. Adverse effects include skin photosensitivity and medication-induced esophagitis.

Educational objective:
Fluoroquinolones (eg, levofloxacin) increase collagen degradation and are associated with adverse effects, including Achilles tendon rupture, retinal detachment, and aortic aneurysm rupture. When possible, fluoroquinolone use should be avoided in patients with a known aortic aneurysm or substantial risk factors for aortic aneurysm.

References

- Aortic dissection and aortic aneurysms associated with fluoroquinolones: a systematic review and meta-analysis.
- Fluoroquinolones and collagen associated severe adverse events: a longitudinal cohort study.

Surgery	Infectious Diseases	Community acquired pneumonia
Subject	System	Topic

Copyright © UWorld. All rights reserved.

and mortality of rupture. Hence, when possible, these drugs should be **avoided** in patients with known **aortic aneurysm** or substantial risk factors for aortic aneurysm (eg, Marfan syndrome, Ehlers-Danlos syndrome, advanced atherosclerotic disease, uncontrolled hypertension).

Other adverse effects of fluoroquinolones that are likely unrelated to collagen degradation include encephalopathy, peripheral neuropathy, and QT-interval prolongation.

(Choice A) Amoxicillin is sometimes used for outpatient treatment of CAP. Adverse effects include hypersensitivity reactions (eg, urticaria, acute interstitial nephritis) and nonallergic skin rash (eg, erythema multiforme).

(Choice B) Macrolides (eg, azithromycin, clarithromycin) can be used as monotherapy for outpatient treatment of CAP or can be combined with a beta-lactam antibiotic for inpatient treatment. Adverse effects include gastrointestinal disturbance (eg, nausea) and QT-interval prolongation.

(Choice C) Ceftriaxone is usually the beta-lactam of choice for inpatient treatment of CAP. Like most beta-lactams, ceftriaxone is associated with hypersensitivity reactions. It is also associated with cholestasis in some patients.

(Choice D) Doxycycline monotherapy is appropriate for outpatient treatment of CAP, and the drug is sometimes combined with a beta-lactam for inpatient treatment. Adverse effects include skin photosensitivity and medication-induced esophagitis.

Educational objective:
Fluoroquinolones (eg, levofloxacin) increase collagen degradation and are associated with adverse effects, including Achilles tendon rupture, retinal detachment, and aortic aneurysm rupture. When possible, fluoroquinolone use should be avoided in patients with a known aortic aneurysm or substantial risk factors for aortic aneurysm.

References

- Aortic dissection and aortic aneurysms associated with fluoroquinolones: a systematic review and meta-analysis.
- Fluoroquinolones and collagen associated severe adverse events: a longitudinal cohort study.

Surgery	Infectious Diseases	Community acquired pneumonia
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 43-year-old man comes to the hospital following 24 hours of increasing pain in the lower abdomen, scrotum, and perineum. He also has experienced malaise and nausea. He has had no abdominal surgeries or recent perianal or scrotal trauma. The patient has a history of morbid obesity, hypertension, type 2 diabetes mellitus, hypercholesterolemia, and heart failure with preserved systolic function. Temperature is 39.7 C (103.5 F), blood pressure is 80/60 mm Hg, pulse is 112/min, and respirations are 18/min. Pulse oximetry shows 96% on room air. BMI is 47 kg/m^2. The patient appears ill and uncomfortable. There is no jugular venous distension. Lungs are clear to auscultation. Heart sounds are normal. The skin over the lower abdomen, scrotum, and perineum is tense, tender, erythematous, and swollen with evidence of crepitus. Mild, bilateral, lower extremity edema is present. Laboratory results are as follows:

Complete blood count

Leukocytes	27,800/mm^3
Bands	20%

Serum chemistry

Bicarbonate	18 mEq/L
Creatinine	1.7 mg/dL
Glucose	280 mg/dL

Coagulation studies

INR	1.4

Blood cultures are obtained, and intravenous fluids and antibiotics are initiated. Which of the following is the best next step in management of this patient?

A. CT scan of the abdomen and perineum

B. Emergent surgery

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Leukocytes	27,800/mm^3
Bands	20%

Serum chemistry

Bicarbonate	18 mEq/L
Creatinine	1.7 mg/dL
Glucose	280 mg/dL

Coagulation studies

INR	1.4

Blood cultures are obtained, and intravenous fluids and antibiotics are initiated. Which of the following is the best next step in management of this patient?

A. CT scan of the abdomen and perineum
B. Emergent surgery
C. Hyperbaric oxygen
D. Intravenous corticosteroid bolus
E. Supportive care in critical care unit

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Leukocytes	27,800/mm^3
Bands	20%

Serum chemistry

Bicarbonate	18 mEq/L
Creatinine	1.7 mg/dL
Glucose	280 mg/dL

Coagulation studies

INR	1.4

Blood cultures are obtained, and intravenous fluids and antibiotics are initiated. Which of the following is the best next step in management of this patient?

- A. CT scan of the abdomen and perineum (19%)
- ✓ B. Emergent surgery (68%)
- C. Hyperbaric oxygen (3%)
- D. Intravenous corticosteroid bolus (1%)
- E. Supportive care in critical care unit (7%)

Omitted
Correct answer

68%
Answered correctly

05 secs
Time Spent

02/01/2020
Last Updated

This patient's rapid-onset skin infection of the lower abdomen, scrotum, and perineum with crepitus and significant systemic manifestations (eg, hypotension, high fever, leukocytosis) likely indicates **Fournier gangrene**, a life-threatening necrotizing fasciitis that quickly progresses to sepsis and death without intervention. Most cases arise in the setting of cutaneous breakdowns in the perianal or genital region, which allow a portal of entry for **polymicrobial** colonic or urogenital organisms. The infection then spreads along the subcutaneous fat via fascial planes and results in microthrombi of cutaneous vessels, leading to subsequent gangrene of the skin. Risk is greatest in those with poorly controlled diabetes mellitus and obesity.

Manifestations generally arise **rapidly** and include:

- Swelling, tenderness, and **crepitus** in the perineum, scrotum, and/or lower abdomen
- Severe systemic symptoms such as high fever and hypotension
- Significant but nonspecific laboratory abnormalities such as leukocytosis, acidemia, renal insufficiency, and coagulopathy

Broad-spectrum antibiotics and intravenous fluids should be administered with urgency, but definitive diagnosis and treatment requires **early surgical exploration and debridement**. Although early surgical intervention improves outcomes and survival rates, >20% of patients with Fournier gangrene die during hospitalization.

(Choice A) Imaging delays surgical intervention and is generally not recommended when the presentation is highly suspicious for Fournier gangrene (eg, skin crepitus, rapid onset of symptoms, hypotension).

(Choice C) Hyperbaric oxygen therapy increases oxygen tissue delivery and may help reduce the ischemia seen in Fournier gangrene. However, surgery is required first in order to remove nonviable tissue and prevent the propagation of the infection.

(Choice D) Glucocorticoids are sometimes given to patients in refractory septic shock (eg, systolic blood pressure <90 mm Hg for >1 hour despite intravenous fluids and vasopressor agents) as they speed shock resolution (although effects on mortality are limited). This patient with a necrotizing skin infection requires surgery and does not meet criteria for refractory septic shock (eg, no vasopressors); glucocorticoids would not be indicated at this time.

(Choice E) This patient would likely receive supportive care in the intensive care unit following surgery; surgical intervention to remove necrotic tissue is required first.

- Severe systemic symptoms such as high fever and hypotension
- Significant but nonspecific laboratory abnormalities such as leukocytosis, acidemia, renal insufficiency, and coagulopathy

Broad-spectrum antibiotics and intravenous fluids should be administered with urgency, but definitive diagnosis and treatment requires **early surgical exploration and debridement**. Although early surgical intervention improves outcomes and survival rates, >20% of patients with Fournier gangrene die during hospitalization.

(Choice A) Imaging delays surgical intervention and is generally not recommended when the presentation is highly suspicious for Fournier gangrene (eg, skin crepitus, rapid onset of symptoms, hypotension).

(Choice C) Hyperbaric oxygen therapy increases oxygen tissue delivery and may help reduce the ischemia seen in Fournier gangrene. However, surgery is required first in order to remove nonviable tissue and prevent the propagation of the infection.

(Choice D) Glucocorticoids are sometimes given to patients in refractory septic shock (eg, systolic blood pressure <90 mm Hg for >1 hour despite intravenous fluids and vasopressor agents) as they speed shock resolution (although effects on mortality are limited). This patient with a necrotizing skin infection requires surgery and does not meet criteria for refractory septic shock (eg, no vasopressors); glucocorticoids would not be indicated at this time.

(Choice E) This patient would likely receive supportive care in the intensive care unit following surgery; surgical intervention to remove necrotic tissue is required first.

Educational objective:
Fournier gangrene is a life-threatening necrotizing fascitis that typically affects perineal, scrotal, and lower abdominal skin. Patients generally have rapid-onset swelling, tenderness, and crepitus of the affected region and significant systemic symptoms (eg, hypotension, high fever). Rapid surgical intervention is required to prevent death and should not be delayed for imaging.

References

- Fournier's gangrene and its emergency management.

Surgery	Male Reproductive System	Necrotizing soft tissue infections
Subject	System	Topic

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 35-year-old woman comes to the office due to persistent rhinorrhea. The patient has clear drainage from the right side of her nose that increases when she has a bowel movement or bends over to pick something off the floor. On examination, the external nose appears normal, the turbinates are pink, and the septum is straight. There is a small amount of clear fluid from her right nostril. The remainder of the examination is normal. Which of the following additional history is most important for establishing a diagnosis in this patient?

A. Family history
B. Illicit drug use
C. Occupation
D. Prior seasonal allergies
E. Recent head trauma
F. Use of decongestant sprays

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 35-year-old woman comes to the office due to persistent rhinorrhea. The patient has clear drainage from the right side of her nose that increases when she has a bowel movement or bends over to pick something off the floor. On examination, the external nose appears normal, the turbinates are pink, and the septum is straight. There is a small amount of clear fluid from her right nostril. The remainder of the examination is normal. Which of the following additional history is most important for establishing a diagnosis in this patient?

- A. Family history (1%)
- B. Illicit drug use (7%)
- C. Occupation (0%)
- D. Prior seasonal allergies (8%)
- ✓ E. Recent head trauma (73%)
- F. Use of decongestant sprays (8%)

Omitted
Correct answer
E

73%
Answered correctly

01 sec
Time Spent

02/05/2020
Last Updated

Explanation

Cerebrospinal fluid rhinorrhea	
Etiology	• Accidental trauma (most common) • Surgical trauma (eg, sinus surgery) • Nontraumatic (eg, elevated intracranial pressure)

Cerebrospinal fluid rhinorrhea	
Etiology	• Accidental trauma (most common) • Surgical trauma (eg, sinus surgery) • Nontraumatic (eg, elevated intracranial pressure)
Clinical presentation	• Unilateral watery rhinorrhea with salty or metallic taste • Possible complication: meningitis
Evaluation	• Test for CSF-specific proteins (β-2 transferrin, β-trace protein) • Imaging (with intrathecal contrast) • Endoscopy (± intrathecal fluorescein dye)
Management	• Bed rest, head of bed elevation, avoidance of straining • Lumbar drain placement • Surgical repair

CSF = cerebral spinal fluid.

Clear, unilateral rhinorrhea that increases at times of relatively increased intracranial pressure (eg, bending over, bowel movements) is suspicious for **cerebrospinal fluid (CSF) rhinorrhea**. Patients also often report a salty or metallic taste. Most cases occur after **head trauma**, especially with fracture of the **skull base** (eg, cribriform plate, temporal bone). CSF rhinorrhea can be evident immediately after the trauma or may have a delayed presentation (days to months) in which rhinorrhea is noted after acute edema resolves.

Testing the nasal discharge for CSF-specific proteins (eg, beta-2 transferrin, beta-trace protein) is diagnostic. Imaging or endoscopic nasal examination can be used to localize the precise site of the defect. Patients typically require **inpatient management** for bed rest, head-of-bed elevation, and frequent neurologic evaluation because they are at risk for **meningitis** due to nasal flora contamination of the CSF. If the CSF rhinorrhea does not resolve with these measures, further interventions (eg, lumbar drain, operative repair) are necessary.

(Choices A and D) A personal or family history of atopy may suggest allergic rhinitis, which would present with bilateral (rather than unilateral) rhinorrhea and pale or bluish, boggy, edematous turbinates. Accompanying symptoms of sneezing, itching, and watery eyes are also typically

CSF = cerebral spinal fluid.

Clear, unilateral rhinorrhea that increases at times of relatively increased intracranial pressure (eg, bending over, bowel movements) is suspicious for **cerebrospinal fluid (CSF) rhinorrhea**. Patients also often report a salty or metallic taste. Most cases occur after **head trauma**, especially with fracture of the **skull base** (eg, cribriform plate, temporal bone). CSF rhinorrhea can be evident immediately after the trauma or may have a delayed presentation (days to months) in which rhinorrhea is noted after acute edema resolves.

Testing the nasal discharge for CSF-specific proteins (eg, beta-2 transferrin, beta-trace protein) is diagnostic. Imaging or endoscopic nasal examination can be used to localize the precise site of the defect. Patients typically require **inpatient management** for bed rest, head-of-bed elevation, and frequent neurologic evaluation because they are at risk for **meningitis** due to nasal flora contamination of the CSF. If the CSF rhinorrhea does not resolve with these measures, further interventions (eg, lumbar drain, operative repair) are necessary.

(Choices A and D) A personal or family history of atopy may suggest allergic rhinitis, which would present with bilateral (rather than unilateral) rhinorrhea and pale or bluish, boggy, edematous turbinates. Accompanying symptoms of sneezing, itching, and watery eyes are also typically present.

(Choices B and F) Intranasal cocaine and nasal decongestants cause vasoconstriction. Overuse can result in bilateral (rather than unilateral) rhinorrhea and severe "rebound" nasal congestion (eg, rhinitis medicamentosa). Examination often shows swollen, erythematous turbinates. Tissue destruction from vasoconstriction caused by intranasal cocaine typically occurs at the septum (resulting in septal perforations) rather than at the skull base.

(Choice C) Patients can be exposed to a variety of substances at work that result in allergic, irritant-induced, or corrosive rhinitis, leading to rhinorrhea. However, such rhinorrhea would be bilateral, and symptoms would increase during times of exposure (ie, at work) rather than with head positioning or straining.

Educational objective:
Clear, unilateral rhinorrhea that increases at times of relatively increased intracranial pressure (eg, bending over, bowel movements) is suspicious for cerebrospinal fluid rhinorrhea, which is most often caused by head trauma and can result in meningitis.

References

- Traumatic CSF leaks of the anterior skull base.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 34-year-old man is brought to the emergency department after a head-on motor vehicle collision. On arrival, blood pressure is 78/40 mm Hg and pulse is 134/min. On physical examination, the patient is alert but intoxicated. Pupils are equal and reactive to light. Ecchymosis in the distribution of a seat belt is present over the chest and abdominal wall. The left chest wall is tender to palpation. Breath sounds are equal bilaterally. Heart sounds are normal. The abdomen is distended and diffusely tender. Portable chest x-ray reveals multiple left rib fractures without pneumothorax or effusion. Cervical spine and pelvic radiographs are negative for fractures and dislocations. Focused Assessment with Sonography for Trauma is negative for pericardial effusion but positive for free intraperitoneal fluid. After rapid infusion of 2 L of intravenous crystalloid, blood pressure is 80/50 mm Hg and pulse is 118/min. Transfusion of uncrossmatched blood is pending. Which of the following is the best next step in management of this patient?

A. Abdominal CT scan
B. Contrast angiography
C. Diagnostic peritoneal lavage
D. Emergent laparotomy
E. Vasopressor therapy

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 34-year-old man is brought to the emergency department after a head-on motor vehicle collision. On arrival, blood pressure is 78/40 mm Hg and pulse is 134/min. On physical examination, the patient is alert but intoxicated. Pupils are equal and reactive to light. Ecchymosis in the distribution of a seat belt is present over the chest and abdominal wall. The left chest wall is tender to palpation. Breath sounds are equal bilaterally. Heart sounds are normal. The abdomen is distended and diffusely tender. Portable chest x-ray reveals multiple left rib fractures without pneumothorax or effusion. Cervical spine and pelvic radiographs are negative for fractures and dislocations. Focused Assessment with Sonography for Trauma is negative for pericardial effusion but positive for free intraperitoneal fluid. After rapid infusion of 2 L of intravenous crystalloid, blood pressure is 80/50 mm Hg and pulse is 118/min. Transfusion of uncrossmatched blood is pending. Which of the following is the best next step in management of this patient?

- A. Abdominal CT scan (4%)
- B. Contrast angiography (0%)
- C. Diagnostic peritoneal lavage (2%)
- ✓ D. Emergent laparotomy (87%)
- E. Vasopressor therapy (4%)

Omitted
Correct answer
D

87%
Answered correctly

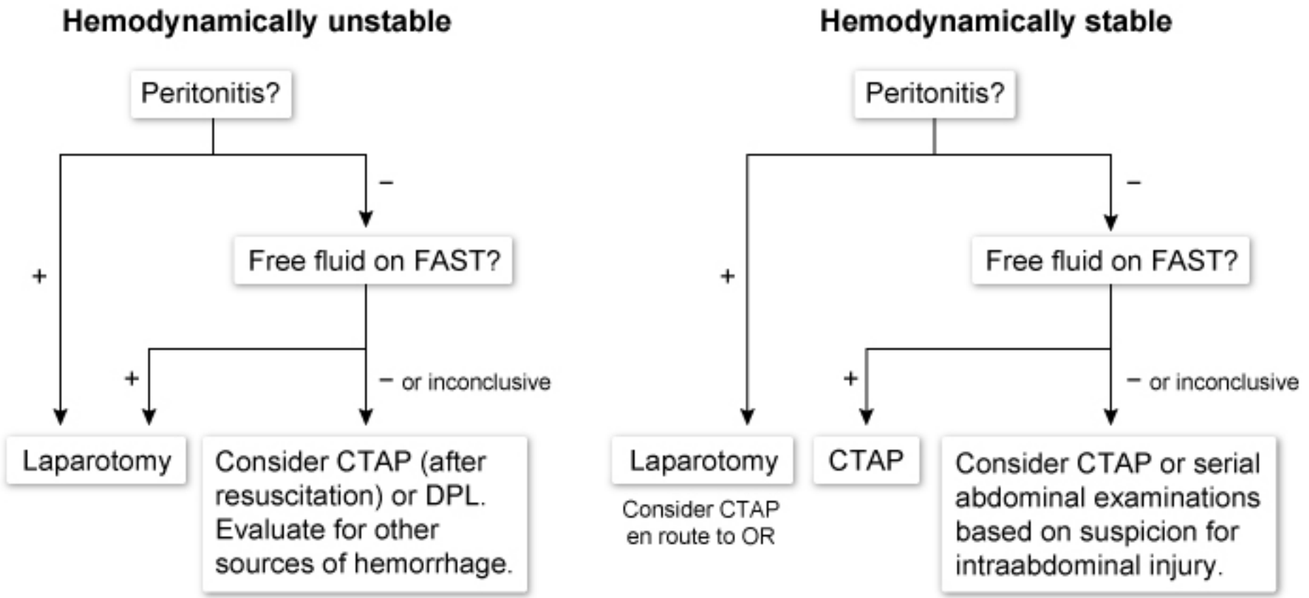
02 secs
Time Spent

03/04/2020
Last Updated

Explanation

Blunt abdominal trauma

Blunt abdominal trauma



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

This hemodynamically unstable patient with blunt chest and abdominal trauma and no life-threatening intrathoracic injuries has free intraperitoneal fluid on Focused Assessment with Sonography for Trauma (FAST) examination. This warrants exploratory laparotomy to control likely intraabdominal hemorrhage.

During the trauma survey of **hemodynamically unstable** (eg, systolic blood pressure <90 mm Hg) patients, the source(s) of instability should be investigated quickly. This includes ruling out rapidly fatal intrathoracic conditions (eg, tension pneumothorax, cardiac tamponade) and identifying major sources of hemorrhage. This patient's bilateral breath sounds and lack of pericardial effusion make tension pneumothorax and tamponade unlikely, respectively. However, his distended abdomen with diffuse tenderness is concerning for intraabdominal hemorrhage due to **blunt abdominal trauma** (BAT).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

This hemodynamically unstable patient with blunt chest and abdominal trauma and no life-threatening intrathoracic injuries has free intraperitoneal fluid on Focused Assessment with Sonography for Trauma (FAST) examination. This warrants exploratory laparotomy to control likely intraabdominal hemorrhage.

During the trauma survey of **hemodynamically unstable** (eg, systolic blood pressure <90 mm Hg) patients, the source(s) of instability should be investigated quickly. This includes ruling out rapidly fatal intrathoracic conditions (eg, tension pneumothorax, cardiac tamponade) and identifying major sources of hemorrhage. This patient's bilateral breath sounds and lack of pericardial effusion make tension pneumothorax and tamponade unlikely, respectively. However, his distended abdomen with diffuse tenderness is concerning for intraabdominal hemorrhage due to **blunt abdominal trauma** (BAT).

For patients with BAT (regardless of hemodynamic status), frank peritonitis (eg, rigidity) warrants immediate laparotomy. In the absence of peritonitis (as in this patient), FAST examination should be performed to identify **intraperitoneal free fluid** (eg, blood, urine, spilled enteric contents).

In hemodynamically unstable patients, a **positive FAST** confirms significant intraabdominal injury and therefore warrants **emergent laparotomy**. If FAST is negative or inconclusive, additional investigations should be considered:

- CT scan can often visualize the site and severity of intraabdominal injury but requires improved hemodynamic stability following resuscitation due to the risk of rapid deterioration in the CT scanner **(Choice A)**.
- Bedside diagnostic peritoneal lavage (DPL) may be considered in patients who remain too hemodynamically unstable for CT scan despite resuscitation **(Choice C)**.

(Choice B) Contrast angiography (with embolization) is sometimes used for BAT patients with intraabdominal hemorrhage due to splenic or hepatic laceration. However, this is only appropriate for hemodynamically stable patients with isolated, lower-grade injuries (typically identified by CT scan).

(Choice E) Vasopressor therapy is contraindicated in the setting of isolated hemorrhagic shock because peripheral vascular tone is already increased (ie, vasoconstriction) to compensate for decreased blood volume. Continued volume resuscitation (eg, crystalloid, blood products) is more appropriate.

Educational objective:
For patients with blunt abdominal trauma who are hemodynamically unstable, emergent laparotomy is indicated in the presence of peritonitis or

contents).

In hemodynamically unstable patients, a **positive FAST** confirms significant intraabdominal injury and therefore warrants **emergent laparotomy**. If FAST is negative or inconclusive, additional investigations should be considered:

- CT scan can often visualize the site and severity of intraabdominal injury but requires improved hemodynamic stability following resuscitation due to the risk of rapid deterioration in the CT scanner **(Choice A)**.
- Bedside diagnostic peritoneal lavage (DPL) may be considered in patients who remain too hemodynamically unstable for CT scan despite resuscitation **(Choice C)**.

(Choice B) Contrast angiography (with embolization) is sometimes used for BAT patients with intraabdominal hemorrhage due to splenic or hepatic laceration. However, this is only appropriate for hemodynamically stable patients with isolated, lower-grade injuries (typically identified by CT scan).

(Choice E) Vasopressor therapy is contraindicated in the setting of isolated hemorrhagic shock because peripheral vascular tone is already increased (ie, vasoconstriction) to compensate for decreased blood volume. Continued volume resuscitation (eg, crystalloid, blood products) is more appropriate.

Educational objective:
For patients with blunt abdominal trauma who are hemodynamically unstable, emergent laparotomy is indicated in the presence of peritonitis or intraperitoneal free fluid on Focused Assessment with Sonography for Trauma (FAST) examination.

References

- Radiology for trauma and the general surgeon.
- Blunt abdominal trauma: imaging and intervention.

Surgery	General Principles	Blunt abdominal trauma
Subject	System	Topic

Copyright © UWorld. All rights reserved.

A 74-year-old woman is brought to the emergency department after acute onset of abdominal pain followed by syncope. The patient was in an exercise class when she suddenly had pain in the left side of her abdomen, quickly followed by loss of consciousness for 30 seconds. She has persistent nausea, dizziness, and diffuse abdominal pain. The patient had no seizure-like activity, chest pain, palpitations, rectal bleeding, or incontinence. There was no trauma. She was diagnosed with chronic lymphocytic leukemia 5 years ago. Other medical conditions include recurrent infections, atrial fibrillation, diverticulosis, and hypertension. Medications include apixaban, metoprolol, and amlodipine, and she has been taking them as prescribed. The patient drinks 4 glasses of wine daily. She does not use tobacco. On examination, the patient is lethargic, pale, and in moderate distress due to abdominal pain. Temperature is 37.3 C (99.1 F), blood pressure is 80/54 mm Hg, pulse is 120/min, and respirations are 14/min. The abdomen is diffusely tender. Bowel sounds are decreased. Laboratory results are as follows:

Complete blood count

Hemoglobin	8.4 g/dL (10.8 one month ago)
Platelets	120,000/mm^3
Leukocytes	27,800/mm^3
Lymphocytes	90%

Coagulation studies

PT	16 sec
INR	1.2
Activated PTT	37 sec

Which of the following is the most likely diagnosis?

A. Bowel perforation

B. Ischemic colitis

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Hemoglobin	8.4 g/dL (10.8 one month ago)
Platelets	120,000/mm^3
Leukocytes	27,800/mm^3
Lymphocytes	90%

Coagulation studies

PT	16 sec
INR	1.2
Activated PTT	37 sec

Which of the following is the most likely diagnosis?

A. Bowel perforation
B. Ischemic colitis
C. Mesenteric artery occlusion
D. Necrotizing pancreatitis
E. Septic shock
F. Splenic rupture

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Hemoglobin	8.4 g/dL (10.8 one month ago)
Platelets	120,000/mm^3
Leukocytes	27,800/mm^3
Lymphocytes	90%

Coagulation studies

PT	16 sec
INR	1.2
Activated PTT	37 sec

Which of the following is the most likely diagnosis?

A. Bowel perforation (19%)
B. Ischemic colitis (12%)
C. Mesenteric artery occlusion (20%)
D. Necrotizing pancreatitis (2%)
E. Septic shock (4%)
✓ F. Splenic rupture (40%)

Omitted
Correct answer

40%
Answered correctly

03 secs
Time Spent

04/11/2020
Last Updated

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Atraumatic splenic rupture	
Risk factors	• Hematologic malignancy (eg, leukemia, lymphoma) • Infection (eg, CMV, EBV, malaria) • Inflammatory disease (eg, SLE, pancreatitis) • Splenic congestion (eg, cirrhosis, pregnancy) • Medications (eg, anticoagulation, G-CSF)
Clinical presentation	• Diffuse or LUQ abdominal pain, peritonitis • Referred left shoulder pain (Kehr sign) • Hemodynamic instability
Diagnosis	• Acute anemia • Intraperitoneal free fluid on imaging
Treatment	• Catheter-based angioembolization (stable patients) • Emergency splenectomy (unstable patients)

CMV = cytomegalovirus; **EBV** = Epstein-Barr virus; **G-CSF** = granulocyte-stimulating colony factor; **LUQ** = left upper quadrant; **SLE** = systemic lupus erythematosus.

This patient with acute-onset abdominal pain, shock, and acute anemia likely has **splenic rupture**, an uncommon but life-threatening complication of chronic lymphocytic leukemia (CLL). Most cases of rupture are associated with blunt abdominal trauma; however, **atraumatic** rupture can also occur. Common **predisposing factors** for atraumatic rupture include **hematologic malignancy** (eg, leukemia, lymphoma), infection (eg, Epstein-Barr virus mononucleosis), and inflammatory disease (eg, systemic lupus erythematosus). These conditions can lead to splenomegaly, derangement of the splenic architecture, and/or thinning of the splenic capsule, increasing the risk of rupture. In the setting of concomitant **anticoagulation** (eg, apixaban for atrial fibrillation) the chances of rupture are greatly increased.

This patient with acute-onset abdominal pain, shock, and acute anemia likely has **splenic rupture**, an uncommon but life-threatening complication of chronic lymphocytic leukemia (CLL). Most cases of rupture are associated with blunt abdominal trauma; however, **atraumatic** rupture can also occur. Common **predisposing factors** for atraumatic rupture include **hematologic malignancy** (eg, leukemia, lymphoma), infection (eg, Epstein-Barr virus mononucleosis), and inflammatory disease (eg, systemic lupus erythematosus). These conditions can lead to splenomegaly, derangement of the splenic architecture, and/or thinning of the splenic capsule, increasing the risk of rupture. In the setting of concomitant **anticoagulation** (eg, apixaban for atrial fibrillation) the chances of rupture are greatly increased.

Examination may reveal **hemodynamic instability**, diffuse abdominal pain, and signs of **peritonitis** (eg, rebound, guarding). On occasion, pain may be referred from the diaphragm and phrenic nerve to the left shoulder (Kehr sign). Focused abdominal ultrasound or CT scan demonstrates free intraperitoneal fluid. Splenectomy is the management of choice in hemodynamically unstable patients, although catheter-based angioembolization may be attempted in stable patients.

(Choice A) Bowel perforation can present with diffuse abdominal pain, signs of peritonitis, and shock; however, it would not explain an acute drop in hemoglobin.

(Choice B) Acute colonic ischemia presents with abdominal pain, but the pain is typically sudden, cramping, and localized. Tenesmus and rectal bleeding or bloody diarrhea may also follow.

(Choice C) Mesenteric artery occlusion causes abdominal pain, but examination is usually unrevealing with pain being out of proportion to findings. Occlusion can occur either from ruptured plaque with in situ thrombus or from a thromboembolic event (eg, due to atrial fibrillation). The diagnosis is less likely in this patient who is taking apixaban as prescribed (coagulation parameters [eg, PT/INR, PTT] are not reliable indicators of direct oral anticoagulant activity).

(Choice D) Necrotizing pancreatitis, similar to other severe inflammatory states, can predispose to splenic rupture, but patients usually first have signs and symptoms of acute pancreatitis such as fever, tachypnea, and severe epigastric pain radiating to the back. Syncope and acute anemia are uncommon.

(Choice E) Septic shock can present with hemodynamic instability and leukocytosis, but a neutrophil-predominant leukocytosis is expected. This patient's lymphocyte-predominant leukocytosis is consistent with underlying CLL.

Educational objective:

Examination may reveal **hemodynamic instability**, diffuse abdominal pain, and signs of **peritonitis** (eg, rebound, guarding). On occasion, pain may be referred from the diaphragm and phrenic nerve to the left shoulder (Kehr sign). Focused abdominal ultrasound or CT scan demonstrates free intraperitoneal fluid. Splenectomy is the management of choice in hemodynamically unstable patients, although catheter-based angioembolization may be attempted in stable patients.

(Choice A) Bowel perforation can present with diffuse abdominal pain, signs of peritonitis, and shock; however, it would not explain an acute drop in hemoglobin.

(Choice B) Acute colonic ischemia presents with abdominal pain, but the pain is typically sudden, cramping, and localized. Tenesmus and rectal bleeding or bloody diarrhea may also follow.

(Choice C) Mesenteric artery occlusion causes abdominal pain, but examination is usually unrevealing with pain being out of proportion to findings. Occlusion can occur either from ruptured plaque with in situ thrombus or from a thromboembolic event (eg, due to atrial fibrillation). The diagnosis is less likely in this patient who is taking apixaban as prescribed (coagulation parameters [eg, PT/INR, PTT] are not reliable indicators of direct oral anticoagulant activity).

(Choice D) Necrotizing pancreatitis, similar to other severe inflammatory states, can predispose to splenic rupture, but patients usually first have signs and symptoms of acute pancreatitis such as fever, tachypnea, and severe epigastric pain radiating to the back. Syncope and acute anemia are uncommon.

(Choice E) Septic shock can present with hemodynamic instability and leukocytosis, but a neutrophil-predominant leukocytosis is expected. This patient's lymphocyte-predominant leukocytosis is consistent with underlying CLL.

Educational objective:
Atraumatic splenic rupture is an uncommon but life-threatening complication of hematologic malignancy, infection, and systemic inflammatory disease, and anticoagulation increases the risk. Patients develop acute abdominal pain, shock, and anemia. Peritonitis and left shoulder pain may also be present.

References

- Diagnosis and treatment of atraumatic splenic rupture: experience of 8 cases.
- Atraumatic splenic rupture associated with apixaban.

in hemoglobin.

(Choice B) Acute colonic ischemia presents with abdominal pain, but the pain is typically sudden, cramping, and localized. Tenesmus and rectal bleeding or bloody diarrhea may also follow.

(Choice C) Mesenteric artery occlusion causes abdominal pain, but examination is usually unrevealing with pain being out of proportion to findings. Occlusion can occur either from ruptured plaque with in situ thrombus or from a thromboembolic event (eg, due to atrial fibrillation). The diagnosis is less likely in this patient who is taking apixaban as prescribed (coagulation parameters [eg, PT/INR, PTT] are not reliable indicators of direct oral anticoagulant activity).

(Choice D) Necrotizing pancreatitis, similar to other severe inflammatory states, can predispose to splenic rupture, but patients usually first have signs and symptoms of acute pancreatitis such as fever, tachypnea, and severe epigastric pain radiating to the back. Syncope and acute anemia are uncommon.

(Choice E) Septic shock can present with hemodynamic instability and leukocytosis, but a neutrophil-predominant leukocytosis is expected. This patient's lymphocyte-predominant leukocytosis is consistent with underlying CLL.

Educational objective:
Atraumatic splenic rupture is an uncommon but life-threatening complication of hematologic malignancy, infection, and systemic inflammatory disease, and anticoagulation increases the risk. Patients develop acute abdominal pain, shock, and anemia. Peritonitis and left shoulder pain may also be present.

References

- Diagnosis and treatment of atraumatic splenic rupture: experience of 8 cases.
- Atraumatic splenic rupture associated with apixaban.

Surgery	Gastrointestinal & Nutrition	Spleen rupture
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 22-year-old man comes to the office due to a left scrotal mass that he first noticed a few months ago. The patient has scrotal heaviness and an increase in the size of the mass after prolonged standing at his job as a supermarket cashier. His symptoms improve when lying down. The patient plays basketball and has not had any scrotal trauma. He is sexually active with his girlfriend and uses condoms consistently. Physical examination shows an irregular, soft mass in the left scrotum above and separate from the left testis. The mass increases in size during Valsalva maneuver and does not transilluminate. Which of the following is the most likely cause of this patient's condition?

A. Cystic dilation of the epididymis
B. Dilation of the pampiniform plexus
C. Fluid in the tunica vaginalis
D. Testicular neoplasia
E. Widening of the femoral ring

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 22-year-old man comes to the office due to a left scrotal mass that he first noticed a few months ago. The patient has scrotal heaviness and an increase in the size of the mass after prolonged standing at his job as a supermarket cashier. His symptoms improve when lying down. The patient plays basketball and has not had any scrotal trauma. He is sexually active with his girlfriend and uses condoms consistently. Physical examination shows an irregular, soft mass in the left scrotum above and separate from the left testis. The mass increases in size during Valsalva maneuver and does not transilluminate. Which of the following is the most likely cause of this patient's condition?

- A. Cystic dilation of the epididymis (3%)
- ✓ B. Dilation of the pampiniform plexus (73%)
- C. Fluid in the tunica vaginalis (5%)
- D. Testicular neoplasia (1%)
- E. Widening of the femoral ring (16%)

Omitted
Correct answer
B

73%
Answered correctly

02 secs
Time Spent

04/12/2020
Last Updated

Explanation

Varicocele	
Clinical presentation	• Soft scrotal mass ("bag of worms") ◦ ↓ In supine position ◦ ↑ With standing/Valsalva maneuvers

Varicocele	
Clinical presentation	• Soft scrotal mass ("bag of worms") ◦ ↓ In supine position ◦ ↑ With standing/Valsalva maneuvers • Subfertility • Testicular atrophy
Ultrasound findings	• Retrograde venous flow • Tortuous, anechoic tubules adjacent to testis • Dilation of pampiniform plexus veins
Treatment	• Gonadal vein ligation (boys & young men with testicular atrophy) • Scrotal support & NSAIDs (older men who do not desire additional children)

NSAIDs = nonsteroidal anti-inflammatory drugs.

Painless scrotal masses are most commonly due to a hydrocele, inguinal hernia, or varicocele and less commonly caused by malignancy. This patient has a soft, **irregular mass** ("bag of worms") directly above the testis that **increases** in size **with Valsalva** and **does not transilluminate**. These findings are consistent with a varicocele, a tortuous **dilation of the pampiniform plexus** surrounding the spermatic cord and testis. Varicoceles typically present in adolescent and young adult males and are more common on the left side. They are often asymptomatic but may cause a dull ache after prolonged standing, as in this patient.

Clinical examination can help differentiate between varicocele and inguinal hernia, which can also present as a painless, soft scrotal mass that does not transilluminate. Like varicoceles, indirect inguinal hernias (caused by a patent processus vaginalis) also increase in size with Valsalva maneuver. However, unlike varicoceles, hernias are often reducible with manipulation; in addition, palpation reveals a soft-tissue mass, unlike the characteristic "bag of worms" texture of a varicocele. A scrotal ultrasound can be useful if the diagnosis remains unclear after clinical examination.

(Choice A) A spermatocele is a fluid-filled cyst of the head of the epididymis that transilluminates. It presents as a painless mass at the superior

NSAIDs = nonsteroidal anti-inflammatory drugs.

Painless scrotal masses are most commonly due to a hydrocele, inguinal hernia, or varicocele and less commonly caused by malignancy. This patient has a soft, **irregular mass** ("bag of worms") directly above the testis that **increases** in size **with Valsalva** and **does not transilluminate**. These findings are consistent with a varicocele, a tortuous **dilation of the pampiniform plexus** surrounding the spermatic cord and testis. Varicoceles typically present in adolescent and young adult males and are more common on the left side. They are often asymptomatic but may cause a dull ache after prolonged standing, as in this patient.

Clinical examination can help differentiate between varicocele and inguinal hernia, which can also present as a painless, soft scrotal mass that does not transilluminate. Like varicoceles, indirect inguinal hernias (caused by a patent processus vaginalis) also increase in size with Valsalva maneuver. However, unlike varicoceles, hernias are often reducible with manipulation; in addition, palpation reveals a soft-tissue mass, unlike the characteristic "bag of worms" texture of a varicocele. A scrotal ultrasound can be useful if the diagnosis remains unclear after clinical examination.

(Choice A) A spermatocele is a fluid-filled cyst of the head of the epididymis that transilluminates. It presents as a painless mass at the superior pole of the testis. A spermatocele does not change in size with positioning or Valsalva maneuvers.

(Choice C) Hydroceles are peritoneal fluid collections between the parietal and visceral layers of the tunica vaginalis. Although communicating hydroceles can change size with positioning, the fluid within a hydrocele is easily transilluminated.

(Choice D) Testicular cancer is a rare but potentially life-threatening, firm testicular mass that does not change with Valsalva maneuvers or positioning.

(Choice E) Widening of the femoral ring can lead to a femoral hernia. Femoral hernias occur most commonly in older women, do not protrude into the scrotum, and present with discomfort at the upper thigh, groin, or pelvis.

Educational objective:
A varicocele is a dilation of the pampiniform plexus that presents as an irregular scrotal mass that increases in size with Valsalva maneuvers and does not transilluminate.

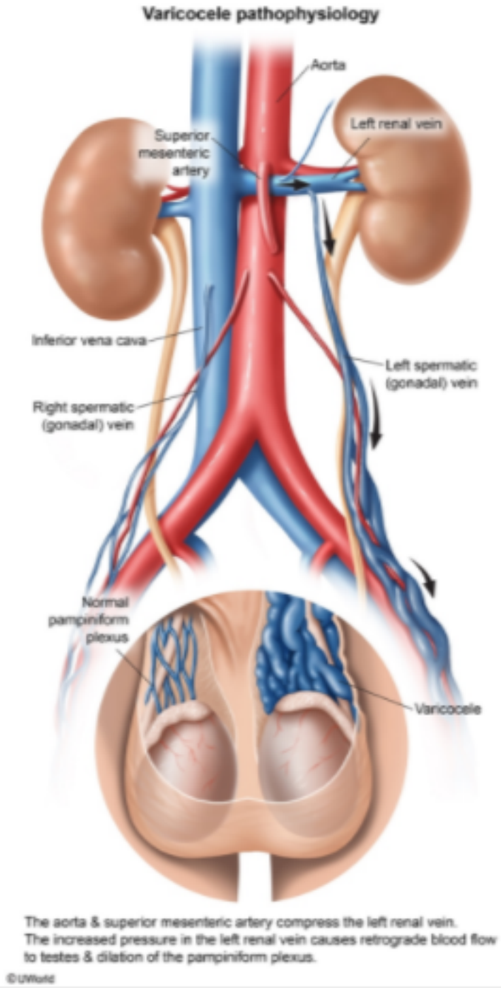
References

- The varicocele.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

NSAIDs = nonsteroidal anti-inflammatory drugs.

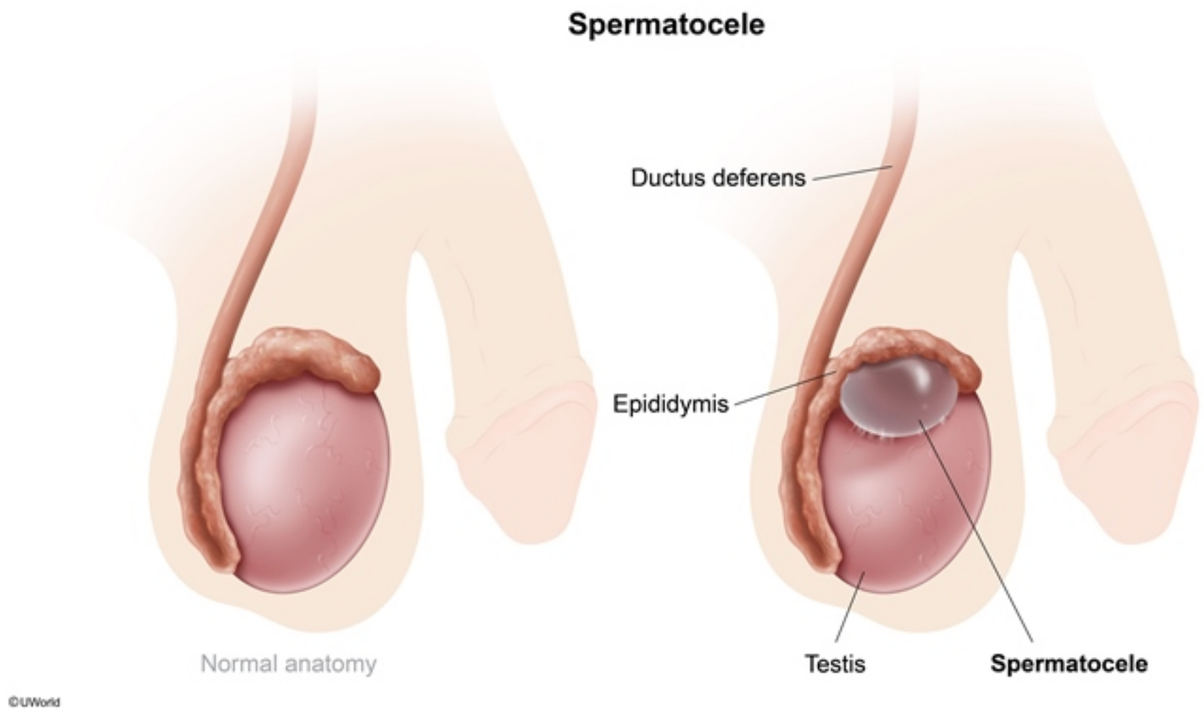
Exhibit Display



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

Painless scrotal masses are most commonly due to a hydrocele, inguinal hernia, or varicocele and less commonly caused by malignancy. This

Exhibit Display

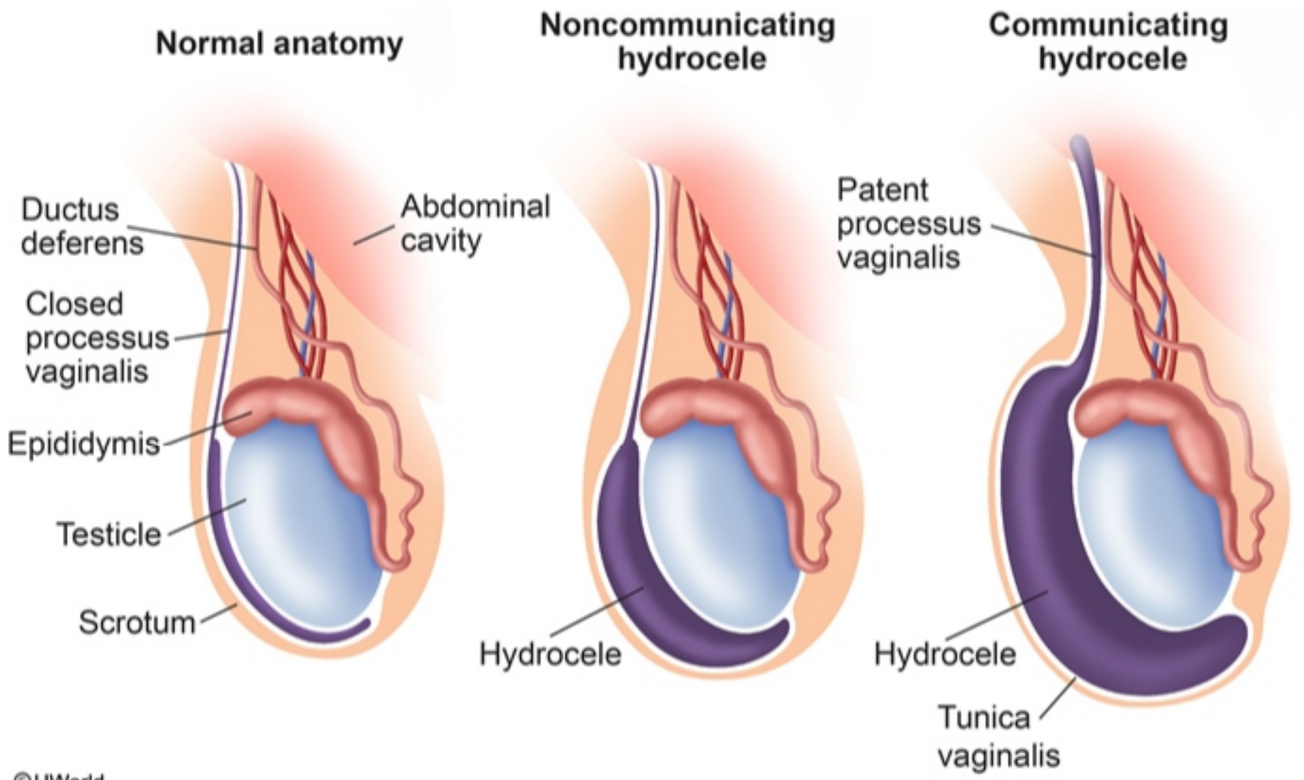


Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

Subject System Topic

Painless scrotal masses are most commonly due to a hydrocele, inguinal hernia, or varicocele and less commonly caused by malignancy. This

Exhibit Display



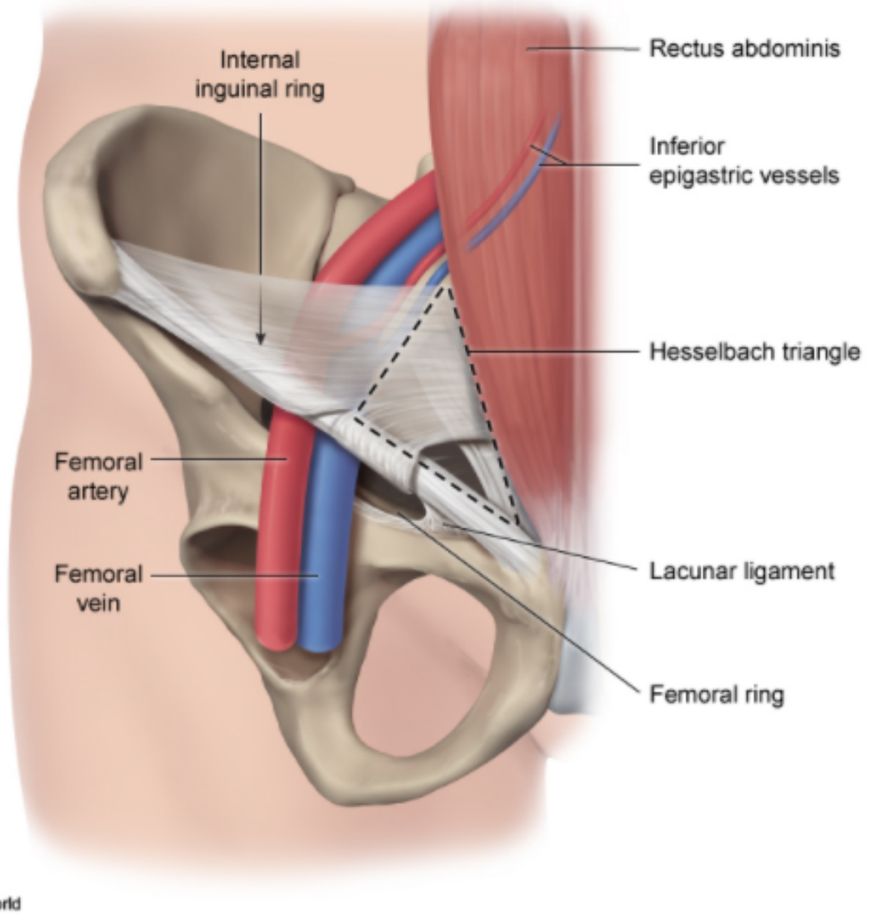
Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

Subject System Topic

Painless scrotal masses are most commonly due to a hydrocele, inguinal hernia, or varicocele and less commonly caused by malignancy. This

Exhibit Display

Groin hernias



©UWorld

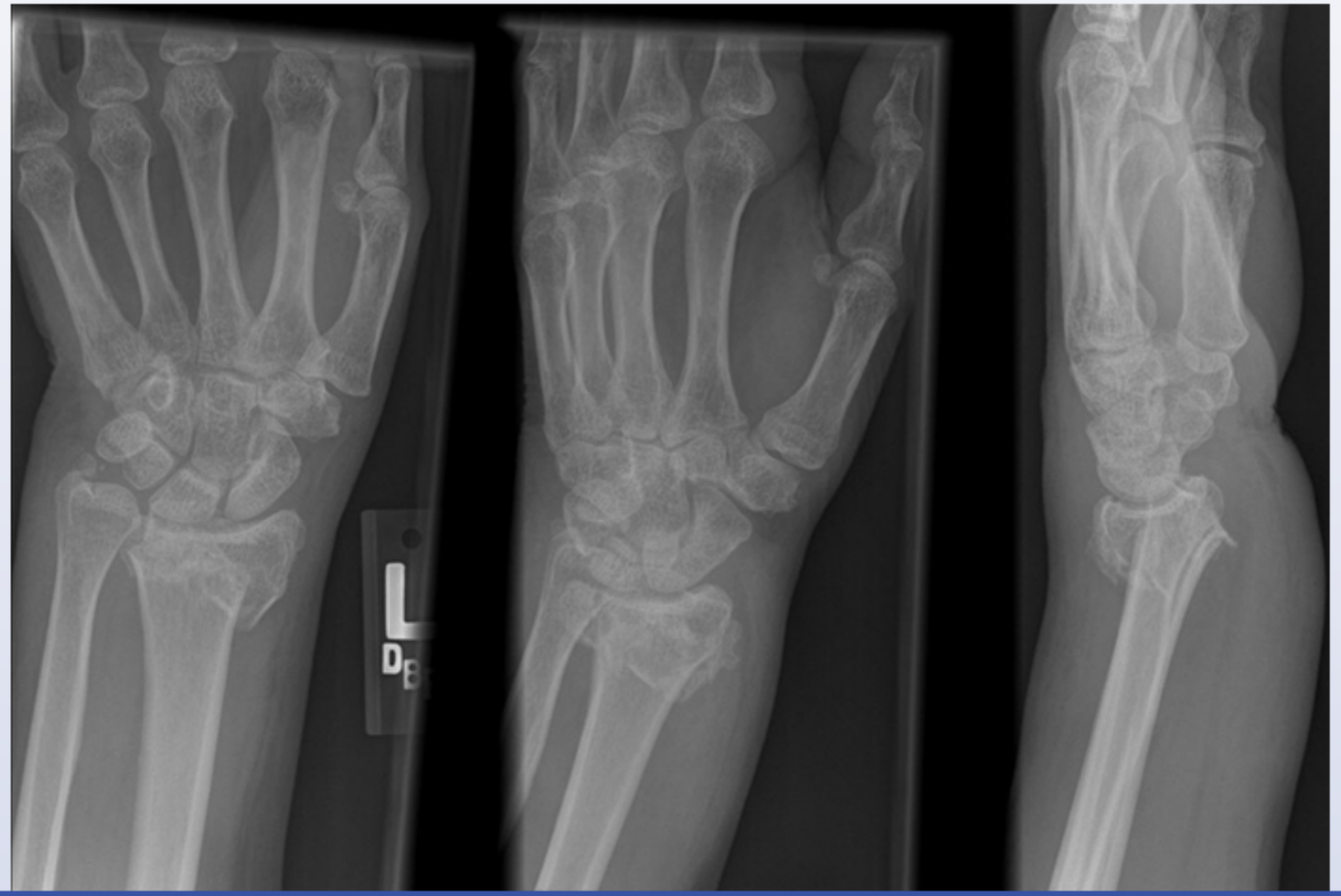
Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

Subject System Topic

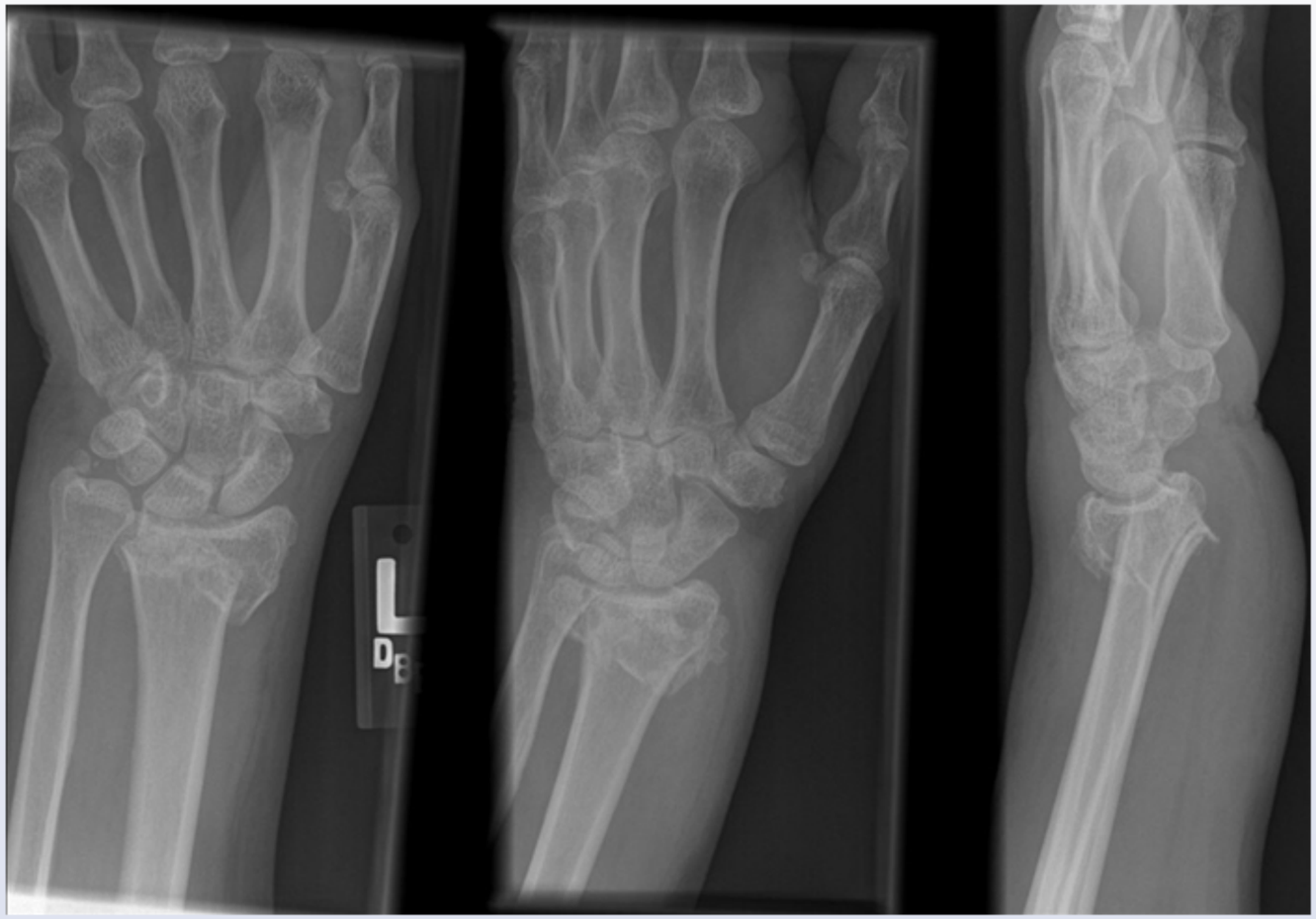
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 45-year-old man comes to the emergency department due to left wrist pain after a fall. The patient was walking in his house when he tripped over a rug and landed on his outstretched hand. His wrist swelled and he applied ice, which did not improve the swelling or pain. Medical history is notable for celiac disease, hypertension, and hypothyroidism for which he takes appropriate daily medications. The patient does not use tobacco, alcohol, or illicit drugs. He has no known medication allergies. BMI is 20 kg/m^2. Examination shows a "dinner-fork" deformity at the left wrist. The wrist is swollen and tender to palpation. Sensation over the left hand is intact, and the patient is able to move all his fingers. X-ray of the left wrist is shown below.



wrist. The wrist is swollen and tender to palpation. Sensation over the left hand is intact, and the patient is able to move all his fingers. X-ray of the left wrist is shown below.



Which of the following is the most significant risk factor for bone fracture in this patient?

A. Age

B. BMI



Which of the following is the most significant risk factor for bone fracture in this patient?

A. Age
B. BMI
C. Celiac disease
D. Hypertension
E. Hypothyroidism
F. Gender

Submit



Which of the following is the most significant risk factor for bone fracture in this patient?

- A. Age (6%)
- B. BMI (10%)
- ✓ C. Celiac disease (59%)
- D. Hypertension (0%)
- E. Hypothyroidism (20%)
- F. Gender (1%)

Omitted
Correct answer

59%
Answered correctly

07 secs
Time Spent

02/08/2020
Last Updated

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Secondary causes of osteoporosis	
Endocrine	• Hyperthyroidism • Hyperparathyroidism • Hypercortisolism • Hypogonadism
Metabolic/ nutritional	• Calcium &/or vitamin D deficiency • Eating disorders
Gastrointestinal/ hepatic	• Malabsorption (eg, celiac disease, Crohn disease) • Chronic liver disease
Renal	• Chronic kidney disease • Renal tubular acidosis
Medications	• Glucocorticoids • Phenytoin, carbamazepine • Proton pump inhibitors
Other	• Inflammatory disorders (eg, rheumatoid arthritis) • Multiple myeloma • Alcoholism • Immobilization

This patient has a distal radius (Colles) fracture after falling on his outstretched hand. Significant fracture due to a ground-level fall is uncommon and often indicates underlying bone fragility due to **osteoporosis**. The most common cause of osteoporosis is declining estrogen levels in women after menopause; the risk is significantly lower in men **(Choice F)**, and osteoporosis in a young or middle-aged man suggests the presence of a secondary cause.

This patient has a distal radius (Colles) fracture after falling on his outstretched hand. Significant fracture due to a ground-level fall is uncommon and often indicates underlying bone fragility due to **osteoporosis**. The most common cause of osteoporosis is declining estrogen levels in women after menopause; the risk is significantly lower in men **(Choice F)**, and osteoporosis in a young or middle-aged man suggests the presence of a secondary cause.

Bone loss is very common in patients with **celiac disease**, largely due to **malabsorption of vitamin D** (impaired absorption of fat-soluble vitamins) and resultant secondary hyperparathyroidism. Bone disease may present as (otherwise) asymptomatic osteopenia/osteoporosis or as osteomalacia with bone pain, muscle weakness, and impaired ambulation. Laboratory evaluation shows low serum 25-hydroxyvitamin D and elevated parathyroid hormone levels. Alkaline phosphatase may be elevated, and hypocalcemia and hypophosphatemia may be observed in severe cases.

(Choice A) The prevalence of osteoporosis increases with age, but in men it is usually seen at age >65. The risk in middle-aged men is low.

(Choice B) The risk of osteoporosis is increased in patients with low body weight (BMI <18.5 kg/m^2), likely due to decreased mechanical stress on the skeleton and comorbid conditions that contribute to both weight loss and osteoporosis (eg, smoking, anorexia nervosa). This patient has normal body weight.

(Choice D) The prevalence of both hypertension and osteoporosis increases with age, and the conditions often coexist. However, hypertension does not contribute to osteoporosis, and thiazide diuretics, commonly used in hypertension, may decrease the risk by reducing renal excretion of calcium.

(Choice E) Hyperthyroidism can increase the risk of osteoporosis due to accelerated bone turnover. Hypothyroidism is not a major risk factor unless thyroid hormone is chronically over-replaced.

Educational objective:
Osteoporosis in a young or middle-aged man suggests a secondary cause. Bone loss is common in celiac disease due to malabsorption of vitamin D. Manifestations may include asymptomatic osteopenia/osteoporosis or osteomalacia with bone pain, muscle weakness, and impaired ambulation.

References

- Osteoporosis in gastrointestinal diseases.

Bone loss is very common in patients with **celiac disease**, largely due to **malabsorption of vitamin D** (impaired absorption of fat-soluble vitamins) and resultant secondary hyperparathyroidism. Bone disease may present as (otherwise) asymptomatic osteopenia/osteoporosis or as osteomalacia with bone pain, muscle weakness, and impaired ambulation. Laboratory evaluation shows low serum 25-hydroxyvitamin D and elevated parathyroid hormone levels. Alkaline phosphatase may be elevated, and hypocalcemia and hypophosphatemia may be observed in severe cases.

(Choice A) The prevalence of osteoporosis increases with age, but in men it is usually seen at age >65. The risk in middle-aged men is low.

(Choice B) The risk of osteoporosis is increased in patients with low body weight (BMI <18.5 kg/m^2), likely due to decreased mechanical stress on the skeleton and comorbid conditions that contribute to both weight loss and osteoporosis (eg, smoking, anorexia nervosa). This patient has normal body weight.

(Choice D) The prevalence of both hypertension and osteoporosis increases with age, and the conditions often coexist. However, hypertension does not contribute to osteoporosis, and thiazide diuretics, commonly used in hypertension, may decrease the risk by reducing renal excretion of calcium.

(Choice E) Hyperthyroidism can increase the risk of osteoporosis due to accelerated bone turnover. Hypothyroidism is not a major risk factor unless thyroid hormone is chronically over-replaced.

Educational objective:
Osteoporosis in a young or middle-aged man suggests a secondary cause. Bone loss is common in celiac disease due to malabsorption of vitamin D. Manifestations may include asymptomatic osteopenia/osteoporosis or osteomalacia with bone pain, muscle weakness, and impaired ambulation.

References

- Osteoporosis in gastrointestinal diseases.

Surgery	Rheumatology/Orthopedics & Sports	Osteoporosis
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Six weeks after a spontaneous, uncomplicated term vaginal delivery, a 32-year-old woman, gravida 1 para 1, comes to the emergency department due to left breast pain. The patient first noticed pain and redness on her left breast a week ago. She has continued to breast feed her infant from the unaffected breast. The patient has no chronic medical conditions and her only medication is a daily multivitamin. Temperature is 38.3 C (101 F). Physical examination shows an area of erythema extending from the areola to the lateral edge of the left breast and surrounding a well-circumscribed, 4-cm area of fluctuance. Axillary lymphadenopathy is present. Which of the following is the best next step in management of this patient?

A. Breast binding and acetaminophen
B. Core needle and skin punch biopsies
C. Ice packs and use of a supportive bra
D. Needle aspiration and antibiotics
E. Warm compresses and massage

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Six weeks after a spontaneous, uncomplicated term vaginal delivery, a 32-year-old woman, gravida 1 para 1, comes to the emergency department due to left breast pain. The patient first noticed pain and redness on her left breast a week ago. She has continued to breast feed her infant from the unaffected breast. The patient has no chronic medical conditions and her only medication is a daily multivitamin. Temperature is 38.3 C (101 F). Physical examination shows an area of erythema extending from the areola to the lateral edge of the left breast and surrounding a well-circumscribed, 4-cm area of fluctuance. Axillary lymphadenopathy is present. Which of the following is the best next step in management of this patient?

- A. Breast binding and acetaminophen (1%)
- B. Core needle and skin punch biopsies (3%)
- C. Ice packs and use of a supportive bra (3%)
- ✓ D. Needle aspiration and antibiotics (68%)
- E. Warm compresses and massage (22%)

Omitted
Correct answer
D

68%
Answered correctly

01 sec
Time Spent

04/06/2020
Last Updated

Explanation

Breast abscess	
Risk factors	• Maternal age >30 • First pregnancy

Breast abscess	
Risk factors	• Maternal age >30 • First pregnancy • Tobacco use
Clinical features	• Fever • Focal inflammation • Fluctuant, tender mass
Diagnosis	• Breast ultrasound
Management	• Antibiotics • Drainage

The patient has a **breast abscess** based on the presence of signs of mastitis (fever, localized erythema/pain) accompanied by a unilateral **fluctuant**, **tender**, **palpable mass**. Breast abscesses typically develop from untreated mastitis (as seen in this patient), which is typically due to incomplete emptying of the breast (eg, poor latch, alternating of breast and bottle feeds) and resultant milk stasis. In turn, persistent or severe mastitis can lead to a focal collection of purulent fluid (abscess). Mastitis and breast abscess are typically caused by ***Staphylococcus aureus***, which enters the breast through nipple trauma (eg, chafing/blistering).

The diagnosis of breast abscess is made clinically, but ultrasound may be required to differentiate severe mastitis from an abscess if a mass is deep within the tissue. Management includes drainage of the abscess with either **needle aspiration** (usually under ultrasound guidance) or incision and drainage. **Empiric antibiotics** against methicillin-sensitive *S aureus* (eg, dicloxacillin, cephalexin) are added for treatment of the surrounding mastitis. Continued breastfeeding is recommended for continued milk drainage.

(Choice A) Breast binding is not recommended for breast engorgement, mastitis, or abscess because it increases pain and facilitates ductal blockage.

(Choice B) Core needle and skin punch biopsies are indicated in the evaluation of inflammatory breast cancer, which can present similar to mastitis or abscess (eg, unilateral breast pain, axillary lymphadenopathy). However, patients typically have peau d'orange skin thickening and a solid (rather than fluctuant) mass.

The patient has a **breast abscess** based on the presence of signs of mastitis (fever, localized erythema/pain) accompanied by a unilateral **fluctuant**, **tender**, **palpable mass**. Breast abscesses typically develop from untreated mastitis (as seen in this patient), which is typically due to incomplete emptying of the breast (eg, poor latch, alternating of breast and bottle feeds) and resultant milk stasis. In turn, persistent or severe mastitis can lead to a focal collection of purulent fluid (abscess). Mastitis and breast abscess are typically caused by ***Staphylococcus aureus***, which enters the breast through nipple trauma (eg, chafing/blistering).

The diagnosis of breast abscess is made clinically, but ultrasound may be required to differentiate severe mastitis from an abscess if a mass is deep within the tissue. Management includes drainage of the abscess with either **needle aspiration** (usually under ultrasound guidance) or incision and drainage. **Empiric antibiotics** against methicillin-sensitive *S aureus* (eg, dicloxacillin, cephalexin) are added for treatment of the surrounding mastitis. Continued breastfeeding is recommended for continued milk drainage.

(Choice A) Breast binding is not recommended for breast engorgement, mastitis, or abscess because it increases pain and facilitates ductal blockage.

(Choice B) Core needle and skin punch biopsies are indicated in the evaluation of inflammatory breast cancer, which can present similar to mastitis or abscess (eg, unilateral breast pain, axillary lymphadenopathy). However, patients typically have peau d'orange skin thickening and a solid (rather than fluctuant) mass.

(Choice C) Ice packs and a supportive bra are indicated in the management of breast pain (ie, mastalgia). Patients with mastalgia have bilateral breast pain with no associated mass.

(Choice E) Warm compresses and massage are indicated in the management of a clogged lactiferous duct, which can present with unilateral breast pain; however, the mass is typically located in the subareolar region and has no associated axillary lymphadenopathy.

Educational objective:
Breast abscesses present with a unilateral fluctuant, tender, palpable breast mass with fever, surrounding erythema/pain, and associated axillary lymphadenopathy. Management includes drainage (eg, needle aspiration) and empiric antibiotics (eg, dicloxacillin, cephalexin).

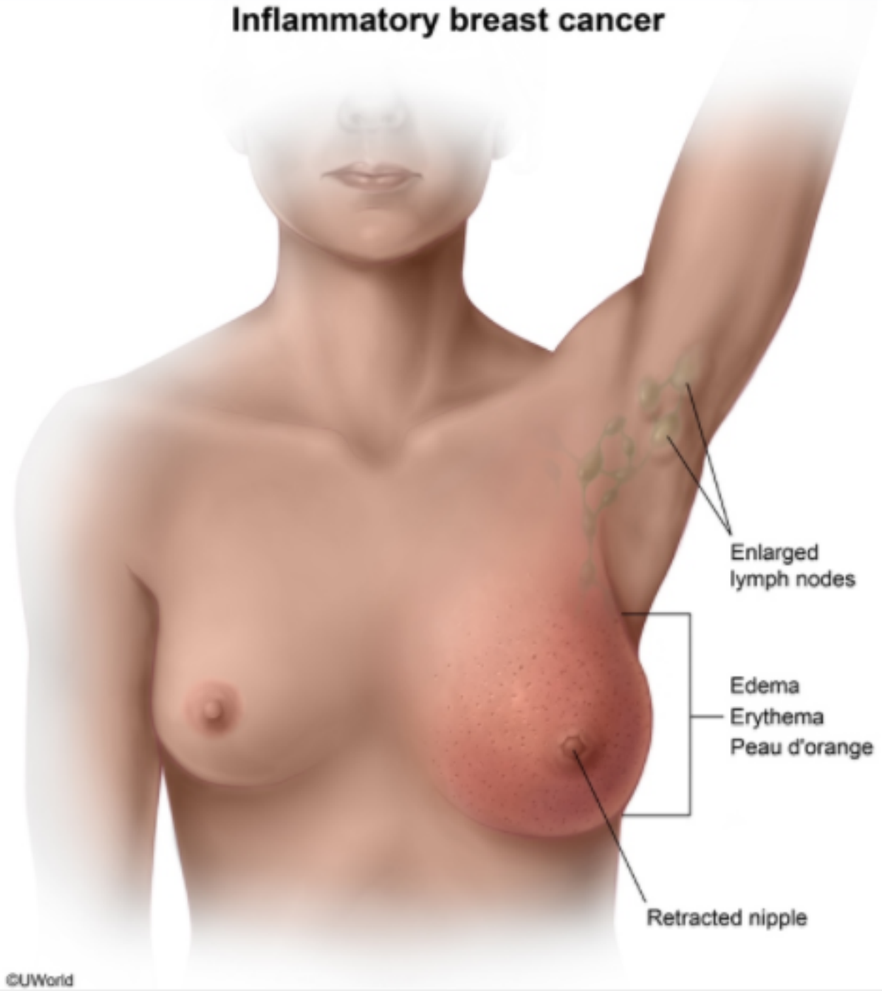
References

- Breast infection: a review of diagnosis and management practices.
- Breast abscess: evidence based management recommendations.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

The patient has a **breast abscess** based on the presence of signs of mastitis (fever, localized erythema/pain) accompanied by a unilateral

Exhibit Display



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

- Breast abscess: evidence based management recommendations.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 24-year-old man with hypoxic-ischemic brain injury is sent to the hospital from a nursing facility for evaluation of a skin ulcer. The patient has a history of injection drug use, and 6 months ago he was found unresponsive at home with agonal respirations and pulseless electrical activity. He required cardiopulmonary resuscitation, endotracheal intubation, and mechanical ventilation. Since then, the patient's neurocognitive functions have not improved, and he receives mechanical ventilation through a tracheostomy and feeding through a gastrostomy tube. Several days ago, the staff noticed a small ulceration over the patient's right heel, which has not healed. Temperature is 37 C (98.6 F), blood pressure is 110/70 mm Hg, and pulse is 68/min. He moans to painful stimuli but does not follow any instructions. Corneal and gag reflexes are present. Heart sounds are normal. Bilateral breath sounds are equal with no added sounds. The abdomen is soft and nontender. Skin examination shows an area of nonblanchable erythema overlying the sacral region. On the posterior aspect of the right heel, there is a skin ulcer that is 2 cm x 1 cm with exposed dermis. Which of the following would have been most effective in preventing this patient's skin lesions?

- A. Aspirin and statin
- B. Compression stockings
- C. Elevation of head of bed to 45 degrees
- D. Frequent skin massage
- E. High-calorie feeding
- F. Pneumatic compression devices
- G. Pressure redistribution

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 24-year-old man with hypoxic-ischemic brain injury is sent to the hospital from a nursing facility for evaluation of a skin ulcer. The patient has a history of injection drug use, and 6 months ago he was found unresponsive at home with agonal respirations and pulseless electrical activity. He required cardiopulmonary resuscitation, endotracheal intubation, and mechanical ventilation. Since then, the patient's neurocognitive functions have not improved, and he receives mechanical ventilation through a tracheostomy and feeding through a gastrostomy tube. Several days ago, the staff noticed a small ulceration over the patient's right heel, which has not healed. Temperature is 37 C (98.6 F), blood pressure is 110/70 mm Hg, and pulse is 68/min. He moans to painful stimuli but does not follow any instructions. Corneal and gag reflexes are present. Heart sounds are normal. Bilateral breath sounds are equal with no added sounds. The abdomen is soft and nontender. Skin examination shows an area of nonblanchable erythema overlying the sacral region. On the posterior aspect of the right heel, there is a skin ulcer that is 2 cm x 1 cm with exposed dermis. Which of the following would have been most effective in preventing this patient's skin lesions?

- A. Aspirin and statin (0%)
- B. Compression stockings (1%)
- C. Elevation of head of bed to 45 degrees (0%)
- D. Frequent skin massage (1%)
- E. High-calorie feeding (0%)
- F. Pneumatic compression devices (2%)
- ✓ G. Pressure redistribution (93%)

Omitted
Correct answer
G

93%
Answered correctly

02 secs
Time Spent

02/14/2020
Last Updated

Explanation

This patient has an extended nursing facility stay with decreased mobility and evidence of significant neurologic injury, and now has a stage II pressure ulcer at the heel and a stage I lesion at the sacrum. Besides reduced mobility, risk factors for pressure ulcers include malnutrition, abnormal mental status (eg, dementia), decreased skin perfusion, and reduced sensation.

Standard interventions to prevent pressure ulcers in high-risk patients include:

- Proper **patient positioning**
- Mobilization
- Careful skin care
- Moisture control
- Maintenance of nutrition

Patients at risk for pressure ulcers should be cared for on beds with features that provide **pressure redistribution** and reduce focal pressure. Effective modifications include air-fluidized beds, pressure-relieving overlays (eg, sheepskin), higher-specification foam mattresses, and active repositioning systems or alternating pressure supports. In addition, patients should be repositioned by the nursing staff at regular intervals (eg, every 2 hours), although there is less evidence to support this intervention.

(Choice A) Aspirin and statins are effective in reducing the risk of acute coronary events in patients with symptomatic atherosclerotic arterial disease. They do not prevent pressure ulcers.

(Choice B) Compression stockings are useful in the prevention and management of venous insufficiency ulcers, which usually occur in the setting of venous stasis dermatitis. They are not beneficial for prevention of pressure ulcers.

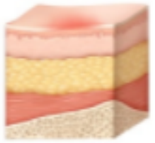
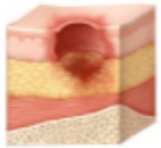
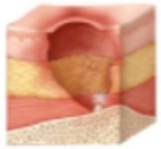
(Choice C) Elevation of the head of the bed to >30 degrees can cause the patient to slide in the bed, causing skin friction and increasing the risk for pressure ulcers.

(Choice D) Tissue overlying bony prominences is particularly susceptible to pressure ulcer formation. Massaging bony prominences is not recommended as it may further increase tension on the overlying skin.

(Choice E) Malnutrition is associated with an increased risk for pressure ulcers. In patients with otherwise normal nutritional status, however, specialized feedings and nutritional supplements have not been shown to reduce the risk for pressure ulcers.

Explanation

Exhibit Display

Stage	Clinical features	Illustration
1	• Intact skin • Non-blanchable with localized redness	
2	• Shallow, open ulcer • Red-pink wound with no sloughing • Possible intact or ruptured blister	
3	• Full-thickness skin loss with possible visible subcutaneous fat • No exposed bone, tendon, or muscles	
4	• Full-thickness skin loss • Exposed bone, tendon, or muscle	
Unstageable	• Full-thickness skin loss • Ulcer base covered by slough and/or eschar that needs removal to stage	

©UWorld

Zoom In Zoom Out Reset Add To Flash Card

specialized feedings and nutritional supplements have not been shown to reduce the risk for pressure ulcers.

(Choice A) Aspirin and statins are effective in reducing the risk of acute coronary events in patients with symptomatic atherosclerotic arterial disease. They do not prevent pressure ulcers.

(Choice B) Compression stockings are useful in the prevention and management of venous insufficiency ulcers, which usually occur in the setting of venous stasis dermatitis. They are not beneficial for prevention of pressure ulcers.

(Choice C) Elevation of the head of the bed to >30 degrees can cause the patient to slide in the bed, causing skin friction and increasing the risk for pressure ulcers.

(Choice D) Tissue overlying bony prominences is particularly susceptible to pressure ulcer formation. Massaging bony prominences is not recommended as it may further increase tension on the overlying skin.

(Choice E) Malnutrition is associated with an increased risk for pressure ulcers. In patients with otherwise normal nutritional status, however, specialized feedings and nutritional supplements have not been shown to reduce the risk for pressure ulcers.

(Choice F) Intermittent pneumatic compression devices are used to prevent deep venous thrombosis in patients with contraindications to anticoagulant therapy. They do not decrease the risk of pressure ulcers.

Educational objective:
Risk factors for pressure ulcers include decreased mobility, malnutrition, abnormal mental status, decreased skin perfusion, and reduced sensation. Interventions that can prevent pressure ulcers include proper positioning for pressure redistribution, mobilization, careful skin care, moisture control, and maintenance of nutrition.

References

- Support surfaces for pressure ulcer prevention.
- Repositioning for pressure ulcer prevention in adults.

Surgery	Dermatology	Pressure induced injury
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 78-year-old man is brought to the emergency department due to an episode of syncope while working in his garden. He is now alert and oriented. He has chest and neck pain that developed just prior to the syncopal episode. Over the past week, he has had a cough, chest tightness, and whitish sputum production. Medical history is significant for long-standing hypertension, hyperlipidemia, and type 2 diabetes mellitus. The patient is a lifetime nonsmoker. Temperature is 37.3 C (99.2 F), blood pressure is 144/92 mm Hg on the right arm and 142/90 mm Hg on the left arm, and pulse is 109/min. ECG shows sinus tachycardia, voltage criteria for left ventricular hypertrophy, and no ST-segment or T-wave changes. Chest x-ray is shown in the exhibit. A bedside transthoracic echocardiogram shows a small pericardial effusion. Which of the following is the best next step in management of this patient?

A. Antibiotics, fluid resuscitation, and admission to intensive care unit
B. Beta blockers, anticoagulation, and admission to intensive care unit
C. Cardiac catheterization
D. CT angiography
E. Immediate emergency pericardiocentesis

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Exhibit Display



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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

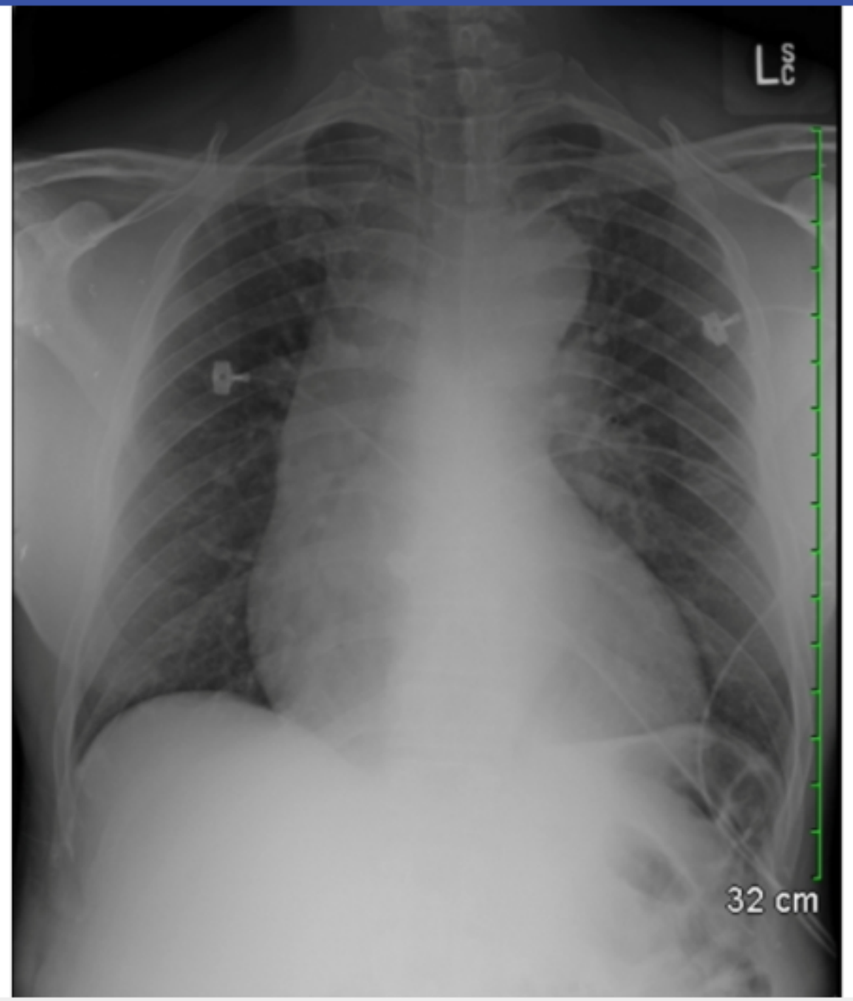
A 78-year-old man is brought to the emergency department due to an episode of syncope while working in his garden. He is now alert and oriented. He has chest and neck pain that developed just prior to the syncopal episode. Over the past week, he has had a cough, chest tightness, and whitish sputum production. Medical history is significant for long-standing hypertension, hyperlipidemia, and type 2 diabetes mellitus. The patient is a lifetime nonsmoker. Temperature is 37.3 C (99.2 F), blood pressure is 144/92 mm Hg on the right arm and 142/90 mm Hg on the left arm, and pulse is 109/min. ECG shows sinus tachycardia, voltage criteria for left ventricular hypertrophy, and no ST-segment or T-wave changes. Chest x-ray is shown in the exhibit. A bedside transthoracic echocardiogram shows a small pericardial effusion. Which of the following is the best next step in management of this patient?

A. Antibiotics, fluid resuscitation, and admission to intensive care unit
B. Beta blockers, anticoagulation, and admission to intensive care unit
C. Cardiac catheterization
D. CT angiography
E. Immediate emergency pericardiocentesis

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Exhibit Display



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

A 78-year-old man is brought to the emergency department due to an episode of syncope while working in his garden. He is now alert and oriented. He has chest and neck pain that developed just prior to the syncopal episode. Over the past week, he has had a cough, chest tightness, and whitish sputum production. Medical history is significant for long-standing hypertension, hyperlipidemia, and type 2 diabetes mellitus. The patient is a lifetime nonsmoker. Temperature is 37.3 C (99.2 F), blood pressure is 144/92 mm Hg on the right arm and 142/90 mm Hg on the left arm, and pulse is 109/min. ECG shows sinus tachycardia, voltage criteria for left ventricular hypertrophy, and no ST-segment or T-wave changes. Chest x-ray is shown in the exhibit. A bedside transthoracic echocardiogram shows a small pericardial effusion. Which of the following is the best next step in management of this patient?

A. Antibiotics, fluid resuscitation, and admission to intensive care unit (6%)
B. Beta blockers, anticoagulation, and admission to intensive care unit (30%)
C. Cardiac catheterization (4%)
✓ D. CT angiography (34%)
E. Immediate emergency pericardiocentesis (24%)

Omitted
Correct answer
D

34%
Answered correctly

46 secs
Time Spent

01/13/2020
Last Updated

Explanation

Acute aortic dissection	
	• History of HTN*, Marfan syndrome, cocaine use

Acute aortic dissection	
Clinical features	• History of HTN*, Marfan syndrome, cocaine use • Severe, sharp, tearing chest or back pain • ± >20 mm Hg variation in SBP between arms
Complications due to extension (involved structure)	• Stroke (carotid artery) • Acute aortic regurgitation (aortic root/valve) • Horner syndrome (carotid sympathetic plexus) • Myocardial ischemia/infarction (coronary artery ostia) • Pericardial effusion/tamponade (pericardium) • Hemothorax (pleural cavity) • Renal injury (renal arteries) • Abdominal pain (mesenteric arteries) • Lower extremity paraplegia (spinal arteries)

HTN = hypertension; **SBP** = systolic blood pressure.

*Strongest overall risk factor.

Although this patient does not have severe chest pain or a pulse differential, his chest and neck pain, syncope, history of hypertension, evidence of **mediastinal widening** on chest radiograph, and **pericardial effusion** are all concerning for **acute aortic dissection**. Pulse differential blood pressure in the upper extremities is an important clinical sign but is present in only 20%-30% of patients; its absence should not be used to exclude aortic dissection. **Type A (ascending aorta)** dissections can lead to aortic rupture into the **pericardial space** and hemopericardium, which can rapidly progress to cardiac tamponade and cardiogenic shock.

As type A aortic dissections are **surgical emergencies** with mortality rates of 1%-2% per hour following symptom onset, confirming or excluding the diagnosis is critical:

- CT angiography is the initial study of choice in hemodynamically stable patients with no evidence of renal dysfunction. It can reveal an intimal flap separating the true and false lumens in the aorta.

Although this patient does not have severe chest pain or a pulse differential, his chest and neck pain, syncope, history of hypertension, evidence of **mediastinal widening** on chest radiograph, and **pericardial effusion** are all concerning for **acute aortic dissection**. Pulse differential blood pressure in the upper extremities is an important clinical sign but is present in only 20%-30% of patients; its absence should not be used to exclude aortic dissection. **Type A (ascending aorta)** dissections can lead to aortic rupture into the **pericardial space** and hemopericardium, which can rapidly progress to cardiac tamponade and cardiogenic shock.

As type A aortic dissections are **surgical emergencies** with mortality rates of 1%-2% per hour following symptom onset, confirming or excluding the diagnosis is critical:

- CT angiography is the initial study of choice in hemodynamically stable patients with no evidence of renal dysfunction. It can reveal an intimal flap separating the true and false lumens in the aorta.
- MR angiography is more time consuming and requires the administration of gadolinium-containing contrast agents for contrast enhancement; it should be avoided in patients with moderate to severe kidney disease due to the risk of nephrogenic systemic fibrosis.
- Transesophageal (not transthoracic) echocardiography has excellent sensitivity and specificity and is the preferred diagnostic study in patients with hemodynamic instability or renal insufficiency; a transthoracic echocardiogram may not visualize parts of the aorta well.

(Choice A) Although this patient may initially have had bronchitis (cough with whitish sputum production and chest discomfort), his current presentation is suggestive of acute aortic dissection. Furthermore, there is no consolidation or infiltrate on chest x-ray; therefore, antibiotics are not indicated. Sudden, transient increases in blood pressure (eg, cocaine use, heavy lifting, cough) can precipitate acute aortic dissection.

(Choice B) Beta blockers are typically used to lower systolic blood pressure in acute aortic dissection. However, the use of anticoagulants in patients with suspected aortic dissection and possible hemopericardium is contraindicated.

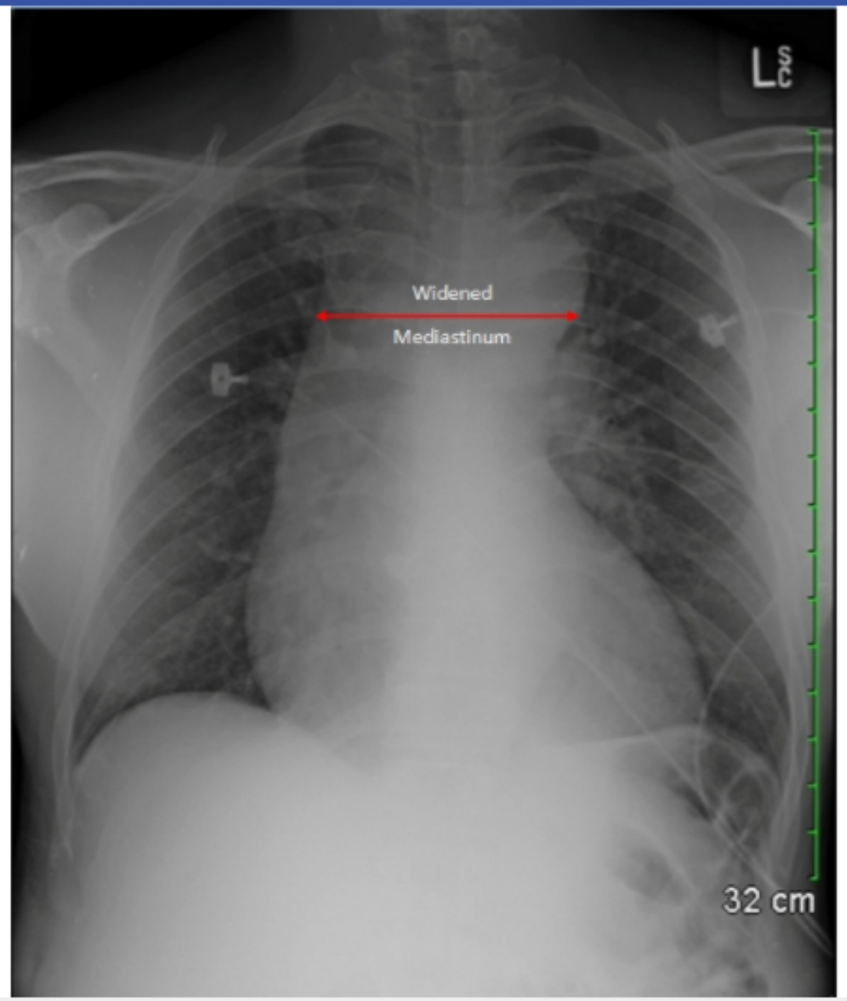
(Choice C) This patient's ECG shows sinus tachycardia along with left ventricular hypertrophy due to long-standing hypertension. There is no indication for cardiac catheterization at this point, and it would likely cause a further delay in definitive diagnosis and management.

(Choice E) Emergency pericardiocentesis is indicated in patients with pericardial effusion and cardiac tamponade (eg, Beck's triad with hypotension, dilated neck veins, and muffled heart sounds) with hemodynamic instability or cardiogenic shock. This patient is hemodynamically stable and has a small pericardial effusion; therefore, emergency pericardiocentesis is not indicated and may lead to complications and therapeutic delay in case the diagnosis of type A dissection is missed.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Although this patient does not have severe chest pain or a pulse differential, his chest and neck pain, syncope, history of hypertension, evidence

Exhibit Display



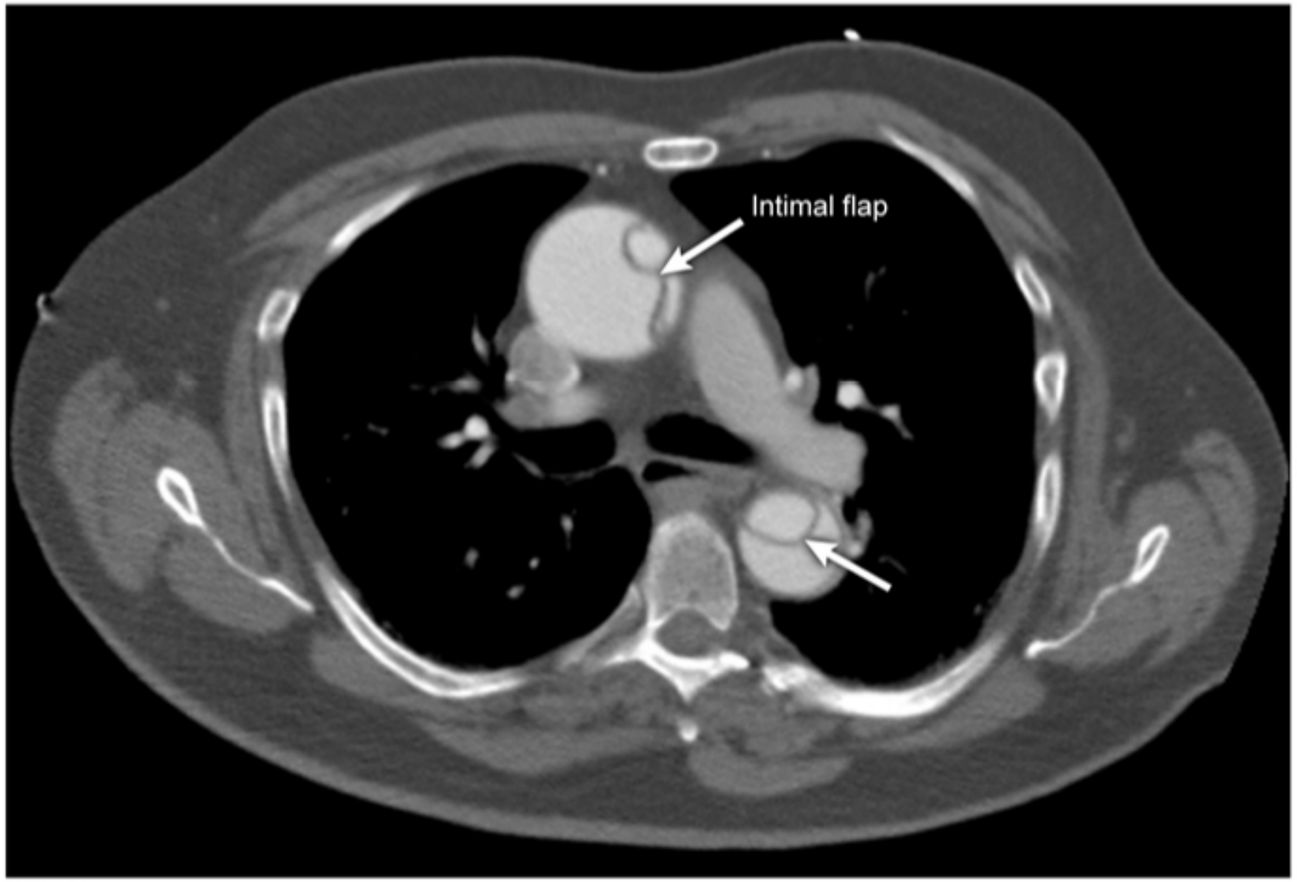
Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Although this patient does not have severe chest pain or a pulse differential, his chest and neck pain, syncope, history of hypertension, evidence

Exhibit Display

Aortic dissection



©UWorld

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

As type A aortic dissections are **surgical emergencies** with mortality rates of 1%-2% per hour following symptom onset, confirming or excluding the diagnosis is critical:

- CT angiography is the initial study of choice in hemodynamically stable patients with no evidence of renal dysfunction. It can reveal an intimal flap separating the true and false lumens in the aorta.
- MR angiography is more time consuming and requires the administration of gadolinium-containing contrast agents for contrast enhancement; it should be avoided in patients with moderate to severe kidney disease due to the risk of nephrogenic systemic fibrosis.
- Transesophageal (not transthoracic) echocardiography has excellent sensitivity and specificity and is the preferred diagnostic study in patients with hemodynamic instability or renal insufficiency; a transthoracic echocardiogram may not visualize parts of the aorta well.

(Choice A) Although this patient may initially have had bronchitis (cough with whitish sputum production and chest discomfort), his current presentation is suggestive of acute aortic dissection. Furthermore, there is no consolidation or infiltrate on chest x-ray; therefore, antibiotics are not indicated. Sudden, transient increases in blood pressure (eg, cocaine use, heavy lifting, cough) can precipitate acute aortic dissection.

(Choice B) Beta blockers are typically used to lower systolic blood pressure in acute aortic dissection. However, the use of anticoagulants in patients with suspected aortic dissection and possible hemopericardium is contraindicated.

(Choice C) This patient's ECG shows sinus tachycardia along with left ventricular hypertrophy due to long-standing hypertension. There is no indication for cardiac catheterization at this point, and it would likely cause a further delay in definitive diagnosis and management.

(Choice E) Emergency pericardiocentesis is indicated in patients with pericardial effusion and cardiac tamponade (eg, Beck's triad with hypotension, dilated neck veins, and muffled heart sounds) with hemodynamic instability or cardiogenic shock. This patient is hemodynamically stable and has a small pericardial effusion; therefore, emergency pericardiocentesis is not indicated and may lead to complications and therapeutic delay in case the diagnosis of type A dissection is missed.

Educational objective:
Acute type A aortic dissection can extend into the pericardial space, causing hemopericardium and rapidly progressing to cardiac tamponade and cardiogenic shock. CT angiography is the initial diagnostic study of choice in hemodynamically stable patients and reveals an intimal flap separating the true and false lumens in the ascending or descending aorta.

References

A 62-year-old woman comes to the office due to a skin lesion. For the last 6 months, the patient has had a slowly enlarging nodule on the back of the neck; it is not associated with pain, itching, or discharge. Medical history is unremarkable. The patient has worked for the last 30 years as a landscape designer. Examination reveals an 8-mm lesion, as shown in the exhibit. Which of the following is the most appropriate next step in management of this patient's lesion?

A. Incisional biopsy
B. Intralesional corticosteroid injection
C. Surgical excision with narrow margin
D. Surgical excision with wide margin
E. Topical salicylic acid therapy

Submit

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

Exhibit Display



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

A 62-year-old woman comes to the office due to a skin lesion. For the last 6 months, the patient has had a slowly enlarging nodule on the back of the neck; it is not associated with pain, itching, or discharge. Medical history is unremarkable. The patient has worked for the last 30 years as a landscape designer. Examination reveals an 8-mm lesion, as shown in the exhibit. Which of the following is the most appropriate next step in management of this patient's lesion?

A. Incisional biopsy
B. Intralesional corticosteroid injection
C. Surgical excision with narrow margin
D. Surgical excision with wide margin
E. Topical salicylic acid therapy

Submit

A 62-year-old woman comes to the office due to a skin lesion. For the last 6 months, the patient has had a slowly enlarging nodule on the back of the neck; it is not associated with pain, itching, or discharge. Medical history is unremarkable. The patient has worked for the last 30 years as a landscape designer. Examination reveals an 8-mm lesion, as shown in the exhibit. Which of the following is the most appropriate next step in management of this patient's lesion?

A. Incisional biopsy (14%)
B. Intralesional corticosteroid injection (1%)
✓ C. Surgical excision with narrow margin (32%)
D. Surgical excision with wide margin (49%)
E. Topical salicylic acid therapy (1%)

Omitted
Correct answer
C

32%
Answered correctly

08 secs
Time Spent

04/26/2020
Last Updated

Explanation

Basal cell carcinoma	
Risk factors	• Sun/ultraviolet light • Fair skin, light hair/eye color • Ionizing radiation • Chronic arsenic exposure

Basal cell carcinoma	
Risk factors	• Sun/ultraviolet light • Fair skin, light hair/eye color • Ionizing radiation • Chronic arsenic exposure
Clinical features	• Slow-growing: locally invasive, rare metastasis • Pink or flesh-colored, pearly papule, ± rolled border • ± Central ulceration (rodent ulcer)
Diagnosis	• Excisional biopsy with narrow margin

This patient has a slow-growing, flesh-colored, translucent nodule on sun-exposed skin, which likely represents **basal cell carcinoma (BCC)**. BCC is the most common skin cancer in the United States; risk factors include fair skin and a history of **heavy sun exposure**. Nodular BCC, which represents up to 80% of cases, is characterized by a **pearly** or **translucent nodule** with an elevated or rolled border and **central telangiectasias**.

BCC rarely metastasizes but can invade nearby tissues (eg, nerves, bone). Nodular BCC is typically managed with **surgical excisional biopsy** with **narrow margins** (eg, 3-5 mm for BCC), which is usually adequate for complete removal of the neoplastic tissue. Excision with narrow margins carries a low (<5%) risk of recurrence while avoiding the sacrifice of large amounts of normal tissue and minimizing the risk of wound complications. For the face and other delicate or cosmetically sensitive areas, Mohs micrographic surgery (sequential removal of thin skin layers with microscopic inspection to confirm that the margins are clear of malignant tissue) is more often performed to ensure complete removal with good cosmetic results.

(Choice A) Incisional biopsy, in which only a representative portion of a lesion is removed, is typically used for large lesions for which excision is impractical or for lesions with a low risk of malignancy. Complete excision of this patient's lesion is easily accomplished and preferred for definitive management.

(Choice B) Intralesional corticosteroid injections are typically used for inflammatory or autoimmune lesions (eg, alopecia areata, discoid lupus

This patient has a slow-growing, flesh-colored, translucent nodule on sun-exposed skin, which likely represents **basal cell carcinoma (BCC)**. BCC is the most common skin cancer in the United States; risk factors include fair skin and a history of **heavy sun exposure**. Nodular BCC, which represents up to 80% of cases, is characterized by a **pearly** or **translucent nodule** with an elevated or rolled border and **central telangiectasias**.

BCC rarely metastasizes but can invade nearby tissues (eg, nerves, bone). Nodular BCC is typically managed with **surgical excisional biopsy** with **narrow margins** (eg, 3-5 mm for BCC), which is usually adequate for complete removal of the neoplastic tissue. Excision with narrow margins carries a low (<5%) risk of recurrence while avoiding the sacrifice of large amounts of normal tissue and minimizing the risk of wound complications. For the face and other delicate or cosmetically sensitive areas, Mohs micrographic surgery (sequential removal of thin skin layers with microscopic inspection to confirm that the margins are clear of malignant tissue) is more often performed to ensure complete removal with good cosmetic results.

(Choice A) Incisional biopsy, in which only a representative portion of a lesion is removed, is typically used for large lesions for which excision is impractical or for lesions with a low risk of malignancy. Complete excision of this patient's lesion is easily accomplished and preferred for definitive management.

(Choice B) Intralesional corticosteroid injections are typically used for inflammatory or autoimmune lesions (eg, alopecia areata, discoid lupus erythematosus), psoriasis, or keloids. They are not indicated for possible neoplastic lesions.

(Choice D) Although wide-margin (eg, >5 mm) excision is indicated for melanoma and high-risk or recurrent nonmelanoma skin cancer, it is associated with greater risk of wound complications and significant scarring and is not necessary for uncomplicated BCC.

(Choice E) Topical salicylic acid is useful for treating common warts and many other benign conditions (eg, acne, psoriasis, corns/calluses). It is occasionally considered in combination with topical fluorouracil for low-risk BCC but has a higher risk of recurrence; excision is generally preferable for definitive management.

Educational objective:
Basal cell carcinoma (BCC) rarely metastasizes but can be locally invasive. Nodular BCC on the trunk or extremities is typically managed with surgical excisional biopsy with narrow (3-5 mm) margins. For the face and other delicate or cosmetically sensitive areas, Mohs micrographic surgery (sequential removal of thin skin layers with microscopic inspection) is more often performed.

References

telangiectasias.

BCC rarely metastasizes but can invade nearby tissues (eg, nerves, bone). Nodular BCC is typically managed with **surgical excisional biopsy** with **narrow margins** (eg, 3-5 mm for BCC), which is usually adequate for complete removal of the neoplastic tissue. Excision with narrow margins carries a low (<5%) risk of recurrence while avoiding the sacrifice of large amounts of normal tissue and minimizing the risk of wound complications. For the face and other delicate or cosmetically sensitive areas, Mohs micrographic surgery (sequential removal of thin skin layers with microscopic inspection to confirm that the margins are clear of malignant tissue) is more often performed to ensure complete removal with good cosmetic results.

(Choice A) Incisional biopsy, in which only a representative portion of a lesion is removed, is typically used for large lesions for which excision is impractical or for lesions with a low risk of malignancy. Complete excision of this patient's lesion is easily accomplished and preferred for definitive management.

(Choice B) Intralesional corticosteroid injections are typically used for inflammatory or autoimmune lesions (eg, alopecia areata, discoid lupus erythematosus), psoriasis, or keloids. They are not indicated for possible neoplastic lesions.

(Choice D) Although wide-margin (eg, >5 mm) excision is indicated for melanoma and high-risk or recurrent nonmelanoma skin cancer, it is associated with greater risk of wound complications and significant scarring and is not necessary for uncomplicated BCC.

(Choice E) Topical salicylic acid is useful for treating common warts and many other benign conditions (eg, acne, psoriasis, corns/calluses). It is occasionally considered in combination with topical fluorouracil for low-risk BCC but has a higher risk of recurrence; excision is generally preferable for definitive management.

Educational objective:
Basal cell carcinoma (BCC) rarely metastasizes but can be locally invasive. Nodular BCC on the trunk or extremities is typically managed with surgical excisional biopsy with narrow (3-5 mm) margins. For the face and other delicate or cosmetically sensitive areas, Mohs micrographic surgery (sequential removal of thin skin layers with microscopic inspection) is more often performed.

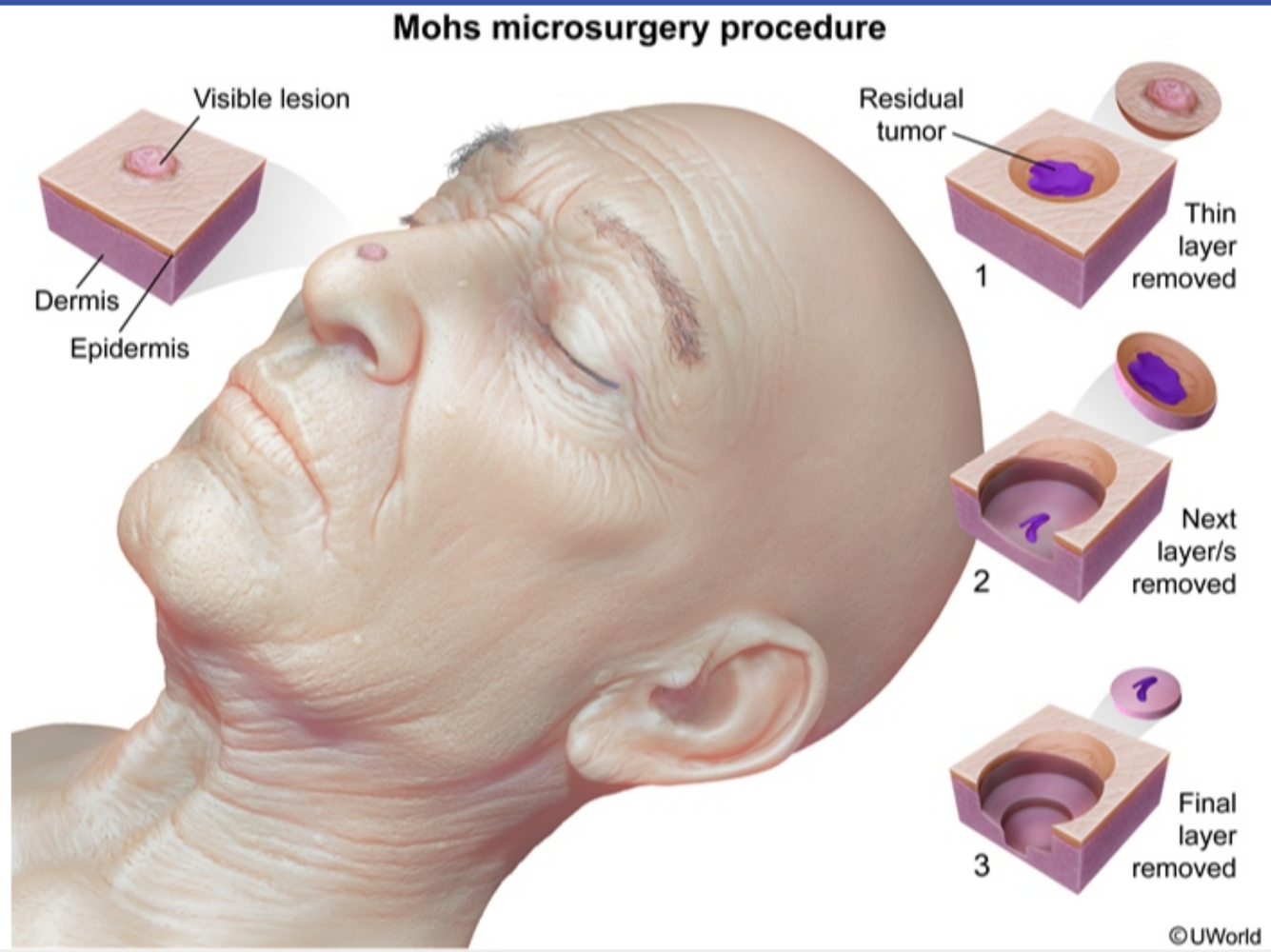
References

- Basal cell carcinoma.

Surgery Dermatology Nonmelanoma skin cancer

telangiectasias.

Exhibit Display



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

Surgery | Dermatology | Nonmelanoma skin cancer

A 42-year-old woman comes to the emergency department due to diffuse abdominal pain. The pain began 6 hours ago while the patient was playing tennis. She reports that the pain started suddenly in the right lower abdomen and has become diffuse and radiates to her right shoulder. The patient has never had this pain before and has no previous trauma. Two months ago, she was hospitalized for a deep venous thrombosis; the patient had been taking combination oral contraceptives, which were discontinued immediately. She has since been taking an oral anticoagulant daily. The patient has no other medical conditions and has had no prior surgery. Her last menstrual period was 3 weeks ago. She does not use tobacco, alcohol, or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 80/40 mm Hg, and pulse is 118/min. Physical examination shows a rigid abdomen with diffuse tenderness, rebound, and guarding. Laboratory results are as follows:

Hematocrit	26%
Platelets	160,000/mm^3
Leukocytes	9,000/mm^3
β-hCG	<5 mIU/mL

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

A. Acute appendicitis
B. Acute mesenteric ischemia
C. Ovarian torsion
D. Ruptured ectopic pregnancy
E. Ruptured ovarian cyst
F. Splenic rupture

Submit

A 42-year-old woman comes to the emergency department due to diffuse abdominal pain. The pain began 6 hours ago while the patient was playing tennis. She reports that the pain started suddenly in the right lower abdomen and has become diffuse and radiates to her right shoulder. The patient has never had this pain before and has no previous trauma. Two months ago, she was hospitalized for a deep venous thrombosis; the patient had been taking combination oral contraceptives, which were discontinued immediately. She has since been taking an oral anticoagulant daily. The patient has no other medical conditions and has had no prior surgery. Her last menstrual period was 3 weeks ago. She does not use tobacco, alcohol, or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 80/40 mm Hg, and pulse is 118/min. Physical examination shows a rigid abdomen with diffuse tenderness, rebound, and guarding. Laboratory results are as follows:

Hematocrit	26%
Platelets	160,000/mm^3
Leukocytes	9,000/mm^3
β-hCG	<5 mIU/mL

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

- A. Acute appendicitis (5%)
- B. Acute mesenteric ischemia (7%)
- C. Ovarian torsion (14%)
- D. Ruptured ectopic pregnancy (7%)
- ✓ E. Ruptured ovarian cyst (60%)
- F. Splenic rupture (5%)

Omitted
Correct answer

60%
Answered correctly

03 secs
Time Spent

06/08/2020
Last Updated

Acute abdominal/pelvic pain in women		
Diagnosis	**Clinical presentation**	**Ultrasound findings**
Mittelschmerz	• Recurrent mild & unilateral mid-cycle pain prior to ovulation • Pain lasts hours to days	Not indicated
Ectopic pregnancy	• Amenorrhea, abdominal/pelvic pain & vaginal bleeding • Positive β-hCG	No intrauterine pregnancy
Ovarian torsion	• Sudden-onset, severe, unilateral lower abdominal pain; nausea & vomiting • Unilateral, tender adnexal mass on examination	Enlarged ovary with decreased or absent blood flow
Ruptured ovarian cyst	• Sudden-onset, severe, unilateral lower abdominal pain immediately following strenuous or sexual activity	Pelvic free fluid
Pelvic inflammatory disease	• Fever/chills, vaginal discharge, lower abdominal pain & cervical motion tenderness	± Tuboovarian abscess

This patient likely has **hemoperitoneum** due to a **ruptured ovarian cyst**. Ovarian cysts are common in ovulating women of reproductive age (like this patient who recently discontinued combined oral contraception) and occur when fluid fills the space of the recently released follicle following ovulation (ie, corpus luteal cyst).

In general, ruptured ovarian cysts are benign and cause minimal lower abdominal pain. However, in patients on anticoagulation (as in this patient being treated for deep vein thrombosis), cyst rupture can cause significant intraabdominal bleeding (ie, hemoperitoneum). Patients classically have **unilateral lower abdominal pain** that becomes increasingly diffuse, often radiating to the shoulder (due to phrenic nerve irritation). As blood fills the abdominal cavity, patients also develop **peritoneal signs** (eg, rigidity, rebound, guarding) and **hemodynamic instability** (eg, hypotension, tachycardia).

This patient likely has **hemoperitoneum** due to a **ruptured ovarian cyst**. Ovarian cysts are common in ovulating women of reproductive age (like this patient who recently discontinued combined oral contraception) and occur when fluid fills the space of the recently released follicle following ovulation (ie, corpus luteal cyst).

In general, ruptured ovarian cysts are benign and cause minimal lower abdominal pain. However, in patients on anticoagulation (as in this patient being treated for deep vein thrombosis), cyst rupture can cause significant intraabdominal bleeding (ie, hemoperitoneum). Patients classically have **unilateral lower abdominal pain** that becomes increasingly diffuse, often radiating to the shoulder (due to phrenic nerve irritation). As blood fills the abdominal cavity, patients also develop **peritoneal signs** (eg, rigidity, rebound, guarding) and **hemodynamic instability** (eg, hypotension, tachycardia).

Diagnosis can be confirmed by pelvic ultrasound, which typically reveals heterogeneous pelvic free fluid and a possible ovarian cyst (if not completely drained). Patients with peritoneal signs and hemodynamic instability require **emergency surgery** (eg, diagnostic laparoscopy).

(Choice A) Acute appendicitis can cause right lower quadrant pain, possibly with rebound and rigidity (if the appendix is perforated); however, patients typically have fever and leukocytosis, which are not seen in this patient.

(Choice B) Acute mesenteric ischemia occurs due to inadequate intestinal perfusion (eg, thromboembolism of the superior mesenteric artery). However, pain is classically out of proportion to the examination (ie, no peritoneal signs). Shoulder pain (indicates abdominal free fluid) would not be present.

(Choice C) Ovarian torsion, which can occur with an ovarian cyst, typically presents with acute lower abdominal pain. However, it does not typically cause hemoperitoneum (eg, hypotension, acute blood loss anemia). Shoulder pain is not seen.

(Choice D) Ruptured ectopic pregnancy can present with hemoperitoneum; however, this patient has a negative quantitative β-hCG level, making this diagnosis unlikely.

(Choice F) Splenic rupture may cause hemoperitoneum but is typically associated with blunt abdominal trauma. In addition, pain initially begins in the left upper quadrant rather than the right lower quadrant.

Educational objective:
A ruptured ovarian cyst can cause hemoperitoneum, which presents with abdominal rigidity, rebound, guarding, and referred shoulder pain. Hemodynamically unstable patients with peritoneal signs require emergency surgery.

In general, ruptured ovarian cysts are benign and cause minimal lower abdominal pain. However, in patients on anticoagulation (as in this patient being treated for deep vein thrombosis), cyst rupture can cause significant intraabdominal bleeding (ie, hemoperitoneum). Patients classically have **unilateral lower abdominal pain** that becomes increasingly diffuse, often radiating to the shoulder (due to phrenic nerve irritation). As blood fills the abdominal cavity, patients also develop **peritoneal signs** (eg, rigidity, rebound, guarding) and **hemodynamic instability** (eg, hypotension, tachycardia).

Diagnosis can be confirmed by pelvic ultrasound, which typically reveals heterogeneous pelvic free fluid and a possible ovarian cyst (if not completely drained). Patients with peritoneal signs and hemodynamic instability require **emergency surgery** (eg, diagnostic laparoscopy).

(Choice A) Acute appendicitis can cause right lower quadrant pain, possibly with rebound and rigidity (if the appendix is perforated); however, patients typically have fever and leukocytosis, which are not seen in this patient.

(Choice B) Acute mesenteric ischemia occurs due to inadequate intestinal perfusion (eg, thromboembolism of the superior mesenteric artery). However, pain is classically out of proportion to the examination (ie, no peritoneal signs). Shoulder pain (indicates abdominal free fluid) would not be present.

(Choice C) Ovarian torsion, which can occur with an ovarian cyst, typically presents with acute lower abdominal pain. However, it does not typically cause hemoperitoneum (eg, hypotension, acute blood loss anemia). Shoulder pain is not seen.

(Choice D) Ruptured ectopic pregnancy can present with hemoperitoneum; however, this patient has a negative quantitative β-hCG level, making this diagnosis unlikely.

(Choice F) Splenic rupture may cause hemoperitoneum but is typically associated with blunt abdominal trauma. In addition, pain initially begins in the left upper quadrant rather than the right lower quadrant.

Educational objective:
A ruptured ovarian cyst can cause hemoperitoneum, which presents with abdominal rigidity, rebound, guarding, and referred shoulder pain. Hemodynamically unstable patients with peritoneal signs require emergency surgery.

References

- Successful conservative management of ruptured ovarian cysts with hemoperitoneum in healthy women.

hypotension, tachycardia).

Diagnosis can be confirmed by pelvic ultrasound, which typically reveals heterogeneous pelvic free fluid and a possible ovarian cyst (if not completely drained). Patients with peritoneal signs and hemodynamic instability require **emergency surgery** (eg, diagnostic laparoscopy).

(Choice A) Acute appendicitis can cause right lower quadrant pain, possibly with rebound and rigidity (if the appendix is perforated); however, patients typically have fever and leukocytosis, which are not seen in this patient.

(Choice B) Acute mesenteric ischemia occurs due to inadequate intestinal perfusion (eg, thromboembolism of the superior mesenteric artery). However, pain is classically out of proportion to the examination (ie, no peritoneal signs). Shoulder pain (indicates abdominal free fluid) would not be present.

(Choice C) Ovarian torsion, which can occur with an ovarian cyst, typically presents with acute lower abdominal pain. However, it does not typically cause hemoperitoneum (eg, hypotension, acute blood loss anemia). Shoulder pain is not seen.

(Choice D) Ruptured ectopic pregnancy can present with hemoperitoneum; however, this patient has a negative quantitative β-hCG level, making this diagnosis unlikely.

(Choice F) Splenic rupture may cause hemoperitoneum but is typically associated with blunt abdominal trauma. In addition, pain initially begins in the left upper quadrant rather than the right lower quadrant.

Educational objective:
A ruptured ovarian cyst can cause hemoperitoneum, which presents with abdominal rigidity, rebound, guarding, and referred shoulder pain. Hemodynamically unstable patients with peritoneal signs require emergency surgery.

References

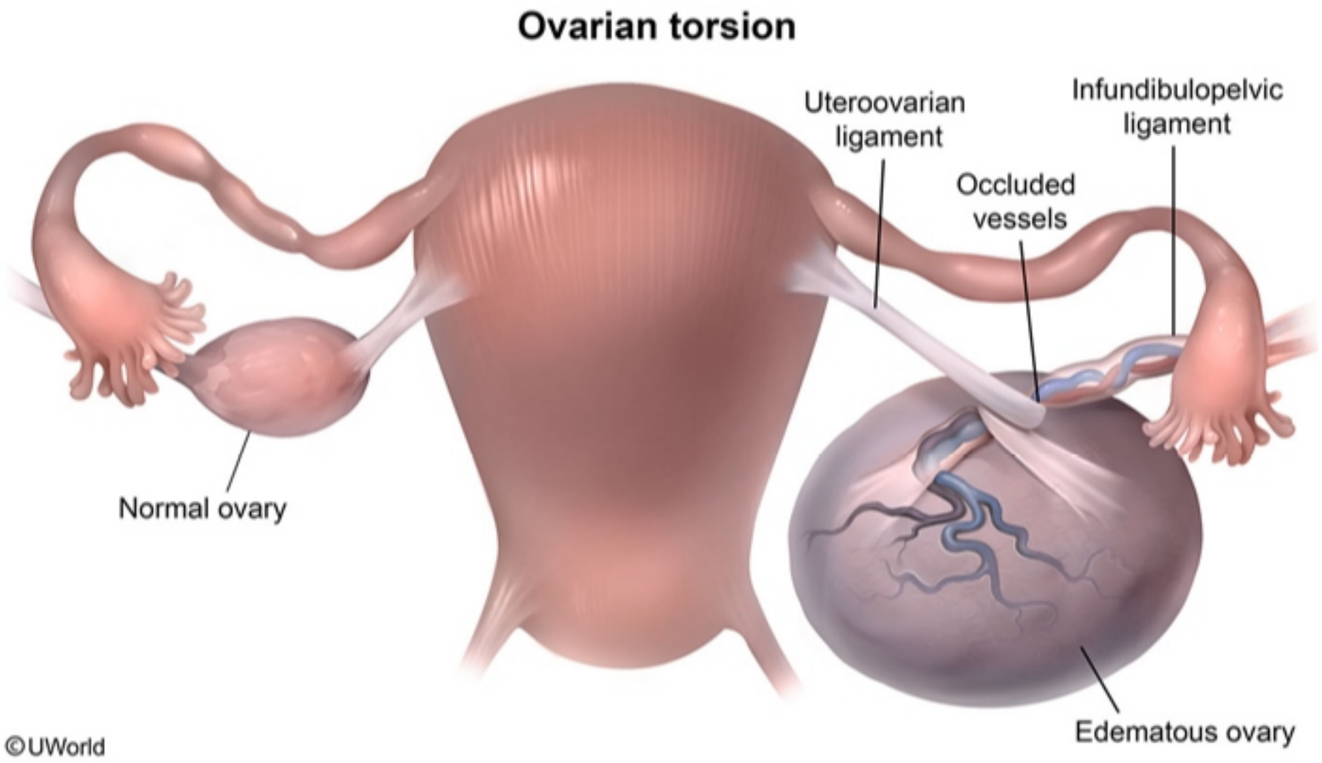
- Successful conservative management of ruptured ovarian cysts with hemoperitoneum in healthy women.

Surgery	Female Reproductive System & Breast	Ovarian cyst
Subject	System	Topic

Copyright © UWorld. All rights reserved.

have **unilateral lower abdominal pain** that becomes increasingly diffuse, often radiating to the shoulder (due to phrenic nerve irritation). As

Exhibit Display

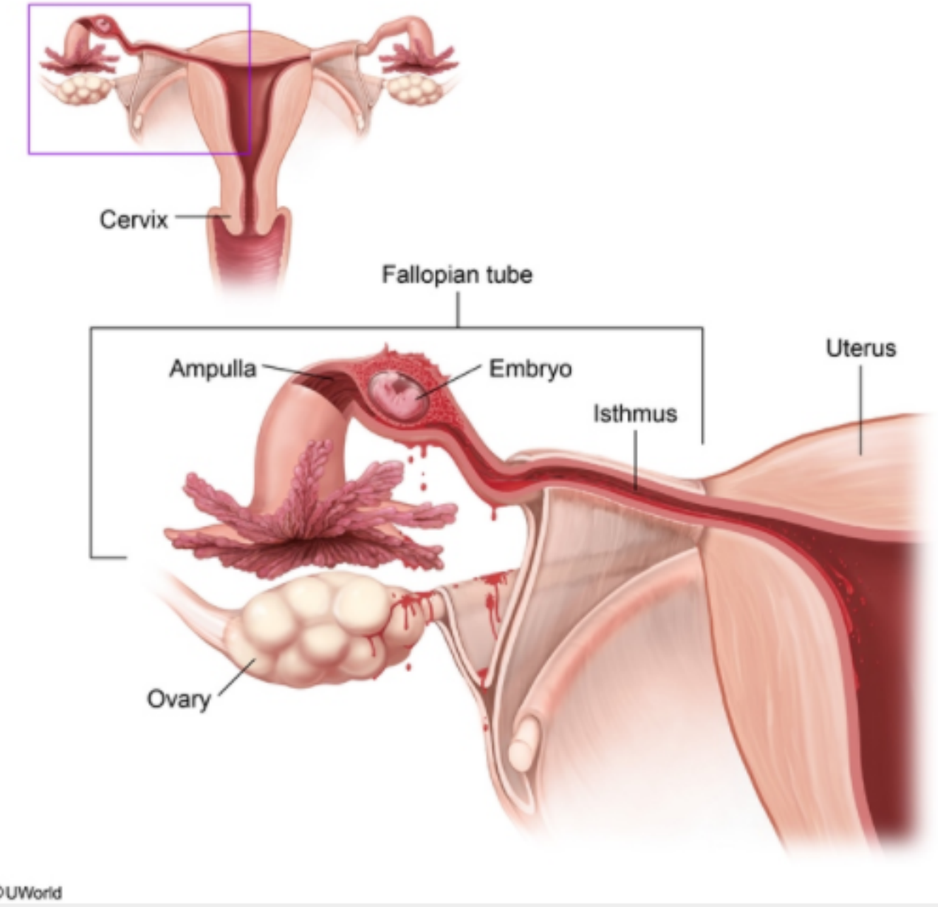


Zoom In | Zoom Out | Reset | Add To New Card | Existing Card

have **unilateral lower abdominal pain** that becomes increasingly diffuse, often radiating to the shoulder (due to phrenic nerve irritation). As

Exhibit Display

Ectopic pregnancy with ruptured fallopian tube



©UWorld

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

A 65-year-old man comes to the office for evaluation of new-onset pain in the right knee. The patient first noticed the pain 3 weeks ago after a long hike in the mountains. The pain has not improved with acetaminophen, and he is now unable to sleep because of it. He has also had intermittent low-grade fevers. The patient has Paget disease of bone, which was diagnosed 10 years ago, and type 2 diabetes mellitus. He drinks alcohol socially but does not use tobacco or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 120/70 mm Hg, and pulse is 80/min. BMI is 23 kg/m^2. The right knee has diffuse soft tissue swelling and a small effusion with no surrounding erythema. The distal aspect of the thigh is tender to palpation. X-ray of the right knee reveals medullary and cortical bone destruction with lucent areas and a surrounding periosteal elevation along the distal femur. Which of the following is the most likely cause of this patient's knee pain?

A. *Borrelia burgdorferi*–induced monoarticular arthritis
B. Destruction and inflammation of articular cartilage
C. Formation of stress-related microfractures
D. Malignant proliferation of osteoid sarcomatous stroma
E. Precipitation of calcium pyrophosphate dihydrate crystals

Submit

A 65-year-old man comes to the office for evaluation of new-onset pain in the right knee. The patient first noticed the pain 3 weeks ago after a long hike in the mountains. The pain has not improved with acetaminophen, and he is now unable to sleep because of it. He has also had intermittent low-grade fevers. The patient has Paget disease of bone, which was diagnosed 10 years ago, and type 2 diabetes mellitus. He drinks alcohol socially but does not use tobacco or illicit drugs. Temperature is 37.2 C (99 F), blood pressure is 120/70 mm Hg, and pulse is 80/min. BMI is 23 kg/m^2. The right knee has diffuse soft tissue swelling and a small effusion with no surrounding erythema. The distal aspect of the thigh is tender to palpation. X-ray of the right knee reveals medullary and cortical bone destruction with lucent areas and a surrounding periosteal elevation along the distal femur. Which of the following is the most likely cause of this patient's knee pain?

A. *Borrelia burgdorferi*–induced monoarticular arthritis (4%)
B. Destruction and inflammation of articular cartilage (7%)
C. Formation of stress-related microfractures (6%)
✓ D. Malignant proliferation of osteoid sarcomatous stroma (79%)
E. Precipitation of calcium pyrophosphate dihydrate crystals (1%)

Omitted
Correct answer
D

79%
Answered correctly

01 sec
Time Spent

02/05/2020
Last Updated

Explanation

This patient with Paget disease of bone now has a destructive femoral lesion, raising strong suspicion for **osteosarcoma**. Most cases occur in a bimodal distribution, as follows:

- In children and adolescents, osteosarcoma usually develops at the metaphysis of long bones, where cellular turnover is high (primary

Explanation

This patient with Paget disease of bone now has a destructive femoral lesion, raising strong suspicion for **osteosarcoma**. Most cases occur in a bimodal distribution, as follows:

- In children and adolescents, osteosarcoma usually develops at the metaphysis of long bones, where cellular turnover is high (primary osteosarcoma).
- In adults age >40, osteosarcoma usually develops at sites of damaged bone, particularly due to **Paget disease of bone**, irradiation, or prior benign bone tumor (secondary osteosarcoma).

Paget disease of bone is associated with increased bone remodeling and bone overgrowth. Although most cases are asymptomatic, the risk of **osteogenic sarcomatous transformation** (at sites of bone overgrowth) is several-thousand times greater than the general population. Manifestations of malignant transformation generally include worsened localized pain and soft tissue swelling. Imaging usually shows a **destructive bone lesion** with a mixture of radiodense and radiolucent areas, a sunburst periosteal pattern, and/or Codman triangle (periosteal elevation). Adults who develop osteosarcoma have a poor prognosis.

(Choice A) Lyme arthritis is a manifestation of *Borrelia burgdorferi* infection usually characterized by monoarticular arthritis of the knee. However, it typically develops months to years after tick exposure. In addition, although erosion of the joint cartilage or bone can sometimes occur, cortical bone destruction with periosteal elevation would be atypical.

(Choice B) Osteoarthritis, characterized by inflammatory destruction of articular cartilage, often involves several joints (eg, knees, hips). Imaging generally shows thickening of subchondral bone, joint space narrowing, and formation of osteophytes.

(Choice C) Stress fracture is an overuse injury to bone caused by repetitive stress (eg, running on pavement). Although stress fracture can be associated with periosteal elevation, cortical thickening, and sclerosis, the presence of bone destruction with radiolucent areas suggests a neoplastic process. In addition, stress fracture is rare in the femur; most cases occur in the tibia and fibula.

(Choice E) Calcium pyrophosphate deposition disease is common in older patients. Symptomatic disease often presents with acute arthritis in the knee (>50% of cases). However, imaging shows cartilage calcification (eg, menisci) and degenerative changes in the joint that are similar to osteoarthritis (eg, subchondral cysts, osteophytes, bone/cartilage fragmentation).

Educational objective:

benign bone tumor (secondary osteosarcoma).

Paget disease of bone is associated with increased bone remodeling and bone overgrowth. Although most cases are asymptomatic, the risk of **osteogenic sarcomatous transformation** (at sites of bone overgrowth) is several-thousand times greater than the general population. Manifestations of malignant transformation generally include worsened localized pain and soft tissue swelling. Imaging usually shows a **destructive bone lesion** with a mixture of radiodense and radiolucent areas, a sunburst periosteal pattern, and/or Codman triangle (periosteal elevation). Adults who develop osteosarcoma have a poor prognosis.

(Choice A) Lyme arthritis is a manifestation of *Borrelia burgdorferi* infection usually characterized by monoarticular arthritis of the knee. However, it typically develops months to years after tick exposure. In addition, although erosion of the joint cartilage or bone can sometimes occur, cortical bone destruction with periosteal elevation would be atypical.

(Choice B) Osteoarthritis, characterized by inflammatory destruction of articular cartilage, often involves several joints (eg, knees, hips). Imaging generally shows thickening of subchondral bone, joint space narrowing, and formation of osteophytes.

(Choice C) Stress fracture is an overuse injury to bone caused by repetitive stress (eg, running on pavement). Although stress fracture can be associated with periosteal elevation, cortical thickening, and sclerosis, the presence of bone destruction with radiolucent areas suggests a neoplastic process. In addition, stress fracture is rare in the femur; most cases occur in the tibia and fibula.

(Choice E) Calcium pyrophosphate deposition disease is common in older patients. Symptomatic disease often presents with acute arthritis in the knee (>50% of cases). However, imaging shows cartilage calcification (eg, menisci) and degenerative changes in the joint that are similar to osteoarthritis (eg, subchondral cysts, osteophytes, bone/cartilage fragmentation).

Educational objective:
Paget disease of bone is associated with increased bone remodeling, which dramatically increases the risk of osteosarcoma. Most cases present with pain, soft tissue swelling, and hallmark radiographic findings (eg, destructive bone lesion, sunburst periosteal reaction, Codman triangle).

Surgery	Rheumatology/Orthopedics & Sports	Bone tumor
Subject	System	Topic

Copyright © UWorld. All rights reserved.

benign bone tumor (secondary osteosarcoma).

Exhibit Display



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

benign bone tumor (secondary osteosarcoma).

Exhibit Display



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

benign bone tumor (secondary osteosarcoma).

Exhibit Display



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

benign bone tumor (secondary osteosarcoma).

Exhibit Display



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

A 34-year-old man is brought to the emergency department after being shot in the right thigh during an attempted robbery. The patient is awake, alert, and in moderate distress. Blood pressure is 101/49 mm Hg and pulse is 122/min. Records indicate that his last tetanus vaccine was a year ago. Physical examination shows a gunshot entry wound on the anteromedial upper right thigh with an exit wound on the lateral thigh. There is a hematoma at the entry site but no active bleeding from either wound. The right lower extremity is cool to the touch and distal pulses are feeble. Radiography of the lower extremity shows no fracture. Which of the following is the most appropriate next step in management of this patient?

- A. Blood transfusion and close observation
- B. Compression dressing and prophylactic antibiotics
- C. CT angiography of the right lower extremity
- D. Doppler ultrasonography of the lower limb vessels
- E. Urgent surgical exploration of the wound

Submit

A 34-year-old man is brought to the emergency department after being shot in the right thigh during an attempted robbery. The patient is awake, alert, and in moderate distress. Blood pressure is 101/49 mm Hg and pulse is 122/min. Records indicate that his last tetanus vaccine was a year ago. Physical examination shows a gunshot entry wound on the anteromedial upper right thigh with an exit wound on the lateral thigh. There is a hematoma at the entry site but no active bleeding from either wound. The right lower extremity is cool to the touch and distal pulses are feeble. Radiography of the lower extremity shows no fracture. Which of the following is the most appropriate next step in management of this patient?

- A. Blood transfusion and close observation (2%)
- B. Compression dressing and prophylactic antibiotics (2%)
- C. CT angiography of the right lower extremity (20%)
- D. Doppler ultrasonography of the lower limb vessels (14%)
- ✓ E. Urgent surgical exploration of the wound (60%)

Omitted
Correct answer
E

60%
Answered correctly

02 secs
Time Spent

01/25/2020
Last Updated

Explanation

Extremity vascular trauma	
	Hard signs • Observed pulsatile bleeding • Presence of bruit/thrill over injury

Extremity vascular trauma	
Clinical manifestations	**Hard signs** • Observed pulsatile bleeding • Presence of bruit/thrill over injury • Expanding hematoma • Signs of distal ischemia **Soft signs** • History of hemorrhage • Diminished pulses • Bony injury • Neurologic abnormality
Evaluation	If hard signs or hemodynamic instability • Surgical exploration Otherwise • Injured extremity index • CT scan or conventional angiography • Duplex Doppler ultrasonography

This patient with a penetrating injury to the anteromedial portion of the upper thigh and hard evidence of vascular injury should undergo prompt surgical exploration. The initial evaluation and management of patients with **severe extremity injury** includes hemorrhage control, radiography of skeletal injuries, and evaluation of the neurovascular bundle. Vascular assessment should focus on identifying **hard signs** of injury, including:

- Observed pulsatile bleeding
- Presence of a bruit or thrill over the injury
- Expanding hematoma

This patient with a penetrating injury to the anteromedial portion of the upper thigh and hard evidence of vascular injury should undergo prompt surgical exploration. The initial evaluation and management of patients with **severe extremity injury** includes hemorrhage control, radiography of skeletal injuries, and evaluation of the neurovascular bundle. Vascular assessment should focus on identifying **hard signs** of injury, including:

- Observed pulsatile bleeding
- Presence of a bruit or thrill over the injury
- Expanding hematoma
- Signs of **distal ischemia** (eg, absent pulses, cool extremities)

In the presence of a penetrating injury, such signs (with or without hemodynamic instability) are almost universally predictive of the need for **urgent surgical repair** and warrant immediate exploration. If the area of damage is unclear, arteriography can be performed intraoperatively to clarify anatomy.

If hard signs are absent, further evaluation for soft signs (eg, history of hemorrhage, diminished pulses, bony injury, neurologic abnormality) should occur. If present, these signs indicate the need for additional testing such as the injured extremity index (similar to ankle-brachial index), which involves comparing the systolic occlusion pressure distally in an injured extremity to the occlusion pressure at a proximal site in an uninjured extremity. If the index is abnormal (≤0.9), patients should be considered for CT scan or conventional arteriography and surgery in conjunction with management of other injuries (eg, bony damage) **(Choice C)**.

(Choice A) Although transfusion is an important component of management, it is an insufficient strategy if not coupled with surgical repair in patients with hard signs of vascular injury.

(Choice B) Compression dressing should be considered during out-of-hospital management, and prophylactic antibiotics are important in cases of open fractures. However, neither is definitive or appropriate for hospitalized patients with clear evidence of vascular injury and hemodynamic instability.

(Choice D) Doppler ultrasonography can be an acceptable alternative to angiography in selected settings if performed by experienced providers. However, when hard signs of vascular injury are present, it would not be the next step.

Educational objective:
Hard signs of vascular injury include pulsatile bleeding, bruits or thrills over the injury, an expanding hematoma, and signs of distal ischemia (eg, absent pulses, cool extremities). In the presence of a penetrating injury, such signs are almost universally predictive of the need for urgent

In the presence of a penetrating injury, such signs (with or without hemodynamic instability) are almost universally predictive of the need for **urgent surgical repair** and warrant immediate exploration. If the area of damage is unclear, arteriography can be performed intraoperatively to clarify anatomy.

If hard signs are absent, further evaluation for soft signs (eg, history of hemorrhage, diminished pulses, bony injury, neurologic abnormality) should occur. If present, these signs indicate the need for additional testing such as the injured extremity index (similar to ankle-brachial index), which involves comparing the systolic occlusion pressure distally in an injured extremity to the occlusion pressure at a proximal site in an uninjured extremity. If the index is abnormal (≤0.9), patients should be considered for CT scan or conventional arteriography and surgery in conjunction with management of other injuries (eg, bony damage) **(Choice C)**.

(Choice A) Although transfusion is an important component of management, it is an insufficient strategy if not coupled with surgical repair in patients with hard signs of vascular injury.

(Choice B) Compression dressing should be considered during out-of-hospital management, and prophylactic antibiotics are important in cases of open fractures. However, neither is definitive or appropriate for hospitalized patients with clear evidence of vascular injury and hemodynamic instability.

(Choice D) Doppler ultrasonography can be an acceptable alternative to angiography in selected settings if performed by experienced providers. However, when hard signs of vascular injury are present, it would not be the next step.

Educational objective:
Hard signs of vascular injury include pulsatile bleeding, bruits or thrills over the injury, an expanding hematoma, and signs of distal ischemia (eg, absent pulses, cool extremities). In the presence of a penetrating injury, such signs are almost universally predictive of the need for urgent surgical repair.

References

- Lower extremity arterial injury: results of 550 cases and review of risk factors associated with limb loss.

Surgery	Cardiovascular System	Gunshot injury
Subject	System	Topic

Copyright © UWorld. All rights reserved.

A 49-year-old woman comes to the emergency department due to 2 weeks of worsening left-sided abdominal pain, fever, and chills. The pain is constant, deep, and radiates to the back. The patient also has had decreased appetite and notes a 2.3-kg (5-lb) weight loss during this period. She has no dysuria, urinary frequency, hematuria, diarrhea, or constipation. The patient underwent laparoscopic cholecystectomy 2 weeks ago for acute calculus cholecystitis. She has a history of type 2 diabetes mellitus, hypertension, and hypothyroidism. Temperature is 39.5 C (103.1 F), blood pressure is 130/80 mm Hg, pulse is 102/min, and respirations are 16/min. Cardiopulmonary examination shows no abnormalities. The spleen is enlarged and tender; there is no hepatomegaly. Bowel sounds are present. The remainder of the examination is normal. Which of the following is the most likely diagnosis?

A. Infected pseudocyst
B. Infectious mononucleosis
C. Non-Hodgkin lymphoma
D. Splenic abscess
E. Splenic infarction
F. Splenic venous thrombosis

Submit

A 49-year-old woman comes to the emergency department due to 2 weeks of worsening left-sided abdominal pain, fever, and chills. The pain is constant, deep, and radiates to the back. The patient also has had decreased appetite and notes a 2.3-kg (5-lb) weight loss during this period. She has no dysuria, urinary frequency, hematuria, diarrhea, or constipation. The patient underwent laparoscopic cholecystectomy 2 weeks ago for acute calculus cholecystitis. She has a history of type 2 diabetes mellitus, hypertension, and hypothyroidism. Temperature is 39.5 C (103.1 F), blood pressure is 130/80 mm Hg, pulse is 102/min, and respirations are 16/min. Cardiopulmonary examination shows no abnormalities. The spleen is enlarged and tender; there is no hepatomegaly. Bowel sounds are present. The remainder of the examination is normal. Which of the following is the most likely diagnosis?

- A. Infected pseudocyst (8%)
- B. Infectious mononucleosis (0%)
- C. Non-Hodgkin lymphoma (1%)
- ✓ D. Splenic abscess (73%)
- E. Splenic infarction (2%)
- F. Splenic venous thrombosis (12%)

Omitted
Correct answer
D

73%
Answered correctly

01 sec
Time Spent

04/06/2020
Last Updated

Explanation

This patient who recently underwent laparoscopic cholecystectomy for cholecystitis now has high fever and tender splenomegaly, raising strong suspicion for **splenic abscess**, a rare, potentially life-threatening complication of bacteremia from a distant infection (eg, infective endocarditis,

This patient who recently underwent laparoscopic cholecystectomy for cholecystitis now has high fever and tender splenomegaly, raising strong suspicion for **splenic abscess**, a rare, potentially life-threatening complication of bacteremia from a distant infection (eg, infective endocarditis, cholecystitis). Risk is greatest in those with immunocompromise from HIV, hematologic malignancy, or **diabetes mellitus**.

Patients usually have **persistent fever** and left upper quadrant pain (sometimes radiating to the back), with or without **splenomegaly**. Anorexia and weight loss may also be seen. Laboratory studies will show leukocytosis with left shift, and chest x-ray frequently reveals an elevated left hemidiaphragm (and/or left pleural effusion). Diagnosis is made with **CT scan of the abdomen**; antibiotic therapy plus **splenectomy** is generally required because many patients fail percutaneous aspiration (due to the presence of occult microabscesses).

(Choice A) Pancreatic pseudocyst, a walled-off collection of fluid around the pancreas following pancreatitis, is generally asymptomatic but may occasionally become infected, leading to fever and epigastric pain that radiates to the back. However, splenomegaly would be atypical, and this patient does not have risk factors for (eg, alcohol abuse) or a recent history of pancreatitis.

(Choice B) Infectious mononucleosis, a manifestation of initial Epstein-Barr virus, frequently causes tender splenomegaly. However, most cases occur in young adults; high fever is uncommon; and patients generally have tonsillitis/pharyngitis, lymphadenopathy, and severe fatigue.

(Choice C) Non-Hodgkin lymphoma can present with splenomegaly, weight loss, and waxing/waning fevers. However, high fevers are uncommon, and significant splenic tenderness/pain rarely occurs. In addition, most patients have diffuse lymphadenopathy.

(Choice E) Splenic infarction usually presents with left upper quadrant pain. Although fever and splenomegaly can occasionally occur, most patients with splenic infarction have an underlying hypercoagulable disorder, a source of embolic disease (eg, atrial fibrillation), a myeloproliferative neoplasm, or hemoglobinopathy (eg, sickle cell disease). This patient's weight loss, high fever, recent cholecystectomy, and lack of risk factors for splenic infarction make splenic abscess more likely.

(Choice F) Splenic venous thrombosis usually occurs in the setting of portal hypertension from liver disease or pancreatitis. Although splenomegaly can occur, patients would not typically have high fever and weight loss.

Educational objective:
Splenic abscess is a rare, life-threatening complication of bacteremia from a distant infection (eg, infective endocarditis, cholecystitis). Manifestations generally include persistent high fever and tender splenomegaly. Diagnosis is made with CT scan of the abdomen; antibiotic therapy and splenectomy are generally required.

and weight loss may also be seen. Laboratory studies will show leukocytosis with left shift, and chest x-ray frequently reveals an elevated left hemidiaphragm (and/or left pleural effusion). Diagnosis is made with **CT scan of the abdomen**; antibiotic therapy plus **splenectomy** is generally required because many patients fail percutaneous aspiration (due to the presence of occult microabscesses).

(Choice A) Pancreatic pseudocyst, a walled-off collection of fluid around the pancreas following pancreatitis, is generally asymptomatic but may occasionally become infected, leading to fever and epigastric pain that radiates to the back. However, splenomegaly would be atypical, and this patient does not have risk factors for (eg, alcohol abuse) or a recent history of pancreatitis.

(Choice B) Infectious mononucleosis, a manifestation of initial Epstein-Barr virus, frequently causes tender splenomegaly. However, most cases occur in young adults; high fever is uncommon; and patients generally have tonsillitis/pharyngitis, lymphadenopathy, and severe fatigue.

(Choice C) Non-Hodgkin lymphoma can present with splenomegaly, weight loss, and waxing/waning fevers. However, high fevers are uncommon, and significant splenic tenderness/pain rarely occurs. In addition, most patients have diffuse lymphadenopathy.

(Choice E) Splenic infarction usually presents with left upper quadrant pain. Although fever and splenomegaly can occasionally occur, most patients with splenic infarction have an underlying hypercoagulable disorder, a source of embolic disease (eg, atrial fibrillation), a myeloproliferative neoplasm, or hemoglobinopathy (eg, sickle cell disease). This patient's weight loss, high fever, recent cholecystectomy, and lack of risk factors for splenic infarction make splenic abscess more likely.

(Choice F) Splenic venous thrombosis usually occurs in the setting of portal hypertension from liver disease or pancreatitis. Although splenomegaly can occur, patients would not typically have high fever and weight loss.

Educational objective:
Splenic abscess is a rare, life-threatening complication of bacteremia from a distant infection (eg, infective endocarditis, cholecystitis). Manifestations generally include persistent high fever and tender splenomegaly. Diagnosis is made with CT scan of the abdomen; antibiotic therapy and splenectomy are generally required.

Surgery	Gastrointestinal & Nutrition	Splenic abscess
Subject	System	Topic

Copyright © UWorld. All rights reserved.

and weight loss may also be seen. Laboratory studies will show leukocytosis with left shift, and chest x-ray frequently reveals an elevated left hemidiaphragm (and/or left pleural effusion). Diagnosis is made with **CT scan of the abdomen**; antibiotic therapy plus **splenectomy** is generally required because many patients fail percutaneous aspiration (due to the presence of occult microabscesses).

(Choice A) Pancreatic pseudocyst, a walled-off collection of fluid around the pancreas following pancreatitis, is generally asymptomatic but may occasionally become infected, leading to fever and epigastric pain that radiates to the back. However, splenomegaly would be atypical, and this patient does not have risk factors for (eg, alcohol abuse) or a recent history of pancreatitis.

(Choice B) Infectious mononucleosis, a manifestation of initial Epstein-Barr virus, frequently causes tender splenomegaly. However, most cases occur in young adults; high fever is uncommon; and patients generally have tonsillitis/pharyngitis, lymphadenopathy, and severe fatigue.

(Choice C) Non-Hodgkin lymphoma can present with splenomegaly, weight loss, and waxing/waning fevers. However, high fevers are uncommon, and significant splenic tenderness/pain rarely occurs. In addition, most patients have diffuse lymphadenopathy.

(Choice E) Splenic infarction usually presents with left upper quadrant pain. Although fever and splenomegaly can occasionally occur, most patients with splenic infarction have an underlying hypercoagulable disorder, a source of embolic disease (eg, atrial fibrillation), a myeloproliferative neoplasm, or hemoglobinopathy (eg, sickle cell disease). This patient's weight loss, high fever, recent cholecystectomy, and lack of risk factors for splenic infarction make splenic abscess more likely.

(Choice F) Splenic venous thrombosis usually occurs in the setting of portal hypertension from liver disease or pancreatitis. Although splenomegaly can occur, patients would not typically have high fever and weight loss.

Educational objective:
Splenic abscess is a rare, life-threatening complication of bacteremia from a distant infection (eg, infective endocarditis, cholecystitis). Manifestations generally include persistent high fever and tender splenomegaly. Diagnosis is made with CT scan of the abdomen; antibiotic therapy and splenectomy are generally required.

Surgery	Gastrointestinal & Nutrition	Splenic abscess
Subject	System	Topic

Copyright © UWorld. All rights reserved.

A 37-year-old woman comes to the emergency department due to severe, left-sided flank pain that started a day ago. The pain began acutely, is intermittent and colicky, and radiates to the groin. The patient has had associated nausea, 2 episodes of vomiting, and hematuria. Today she developed fever and chills. The patient has no prior medical conditions and takes no medications. Temperature is 38.4 C (101.1 F), blood pressure is 140/86 mm Hg, pulse is 105/min, and respirations are 18/min. Physical examination shows left costovertebral angle tenderness to percussion. A CT scan of the abdomen and pelvis without contrast reveals a 5-mm stone in the left midureter with dilation of the proximal ureter. Which of the following is the strongest indication for an urgent urologic consultation with this patient?

A. Fever and chills
B. Macroscopic hematuria
C. Recurrent vomiting
D. Stone size
E. Ureteral dilation

Submit

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

A 37-year-old woman comes to the emergency department due to severe, left-sided flank pain that started a day ago. The pain began acutely, is intermittent and colicky, and radiates to the groin. The patient has had associated nausea, 2 episodes of vomiting, and hematuria. Today she developed fever and chills. The patient has no prior medical conditions and takes no medications. Temperature is 38.4 C (101.1 F), blood pressure is 140/86 mm Hg, pulse is 105/min, and respirations are 18/min. Physical examination shows left costovertebral angle tenderness to percussion. A CT scan of the abdomen and pelvis without contrast reveals a 5-mm stone in the left midureter with dilation of the proximal ureter. Which of the following is the strongest indication for an urgent urologic consultation with this patient?

- A. Fever and chills (36%)
- B. Macroscopic hematuria (7%)
- C. Recurrent vomiting (1%)
- D. Stone size (17%)
- E. Ureteral dilation (37%)

Omitted
Correct answer
A

36%
Answered correctly

01 sec
Time Spent

01/21/2020
Last Updated

Explanation

This patient has acute flank pain and nausea due to **ureterolithiasis**, which is confirmed on CT scan. Initial management includes **hydration**, **pain medication** (nonsteroidal anti-inflammatory drugs [eg, ketorolac, diclofenac] are generally preferred over opioids), and antiemetics (eg, metoclopramide). Patients should be counseled to strain the urine to confirm stone passage and recover the stone for qualitative analysis.

This patient has acute flank pain and nausea due to **ureterolithiasis**, which is confirmed on CT scan. Initial management includes **hydration**, **pain medication** (nonsteroidal anti-inflammatory drugs [eg, ketorolac, diclofenac] are generally preferred over opioids), and antiemetics (eg, metoclopramide). Patients should be counseled to strain the urine to confirm stone passage and recover the stone for qualitative analysis.

Patients with signs of **urosepsis** (eg, fever, tachycardia), as in this patient; anuria; **acute kidney injury**; or refractory pain require urgent **urologic consultation** for possible percutaneous nephrostomy or ureteral stent insertion. In addition, those with large stones that are unlikely to pass spontaneously **(≥10 mm)**, or those whose stones do not pass within 4-5 weeks, also warrant urologic evaluation (eg, in the outpatient setting) to consider more aggressive interventions (eg, lithotripsy, ureteroscopic intervention).

(Choices B and E) Hematuria (gross or microscopic) is present in most patients with symptomatic stones. Ureteral dilation is also seen in >80% of those with symptomatic stones and would be expected given that ureteral obstruction is the source of much of the pain in these patients. However, in the absence of complete obstruction (eg, anuria) and marked ureteral dilation or hydronephrosis, acute interventional management is not required.

(Choice C) Acute renal colic is often associated with severe pain and vomiting, but these symptoms usually abate with symptomatic treatment. Although urologic intervention is warranted for refractory symptoms, this patient has only had 2 episodes of vomiting and her symptoms are likely to resolve with spontaneous stone passage..

(Choice D) Most stones ≤5 mm in diameter pass spontaneously with conservative management and do not require additional intervention. Alpha blockers (eg, tamsulosin) can be used to facilitate passage, especially for intermediate-sized stones (6-10 mm). Urologic evaluation is recommended for stones ≥10 mm.

Educational objective:
Urologic consultation is advised for ureterolithiasis associated with urosepsis, anuria, acute kidney injury, or refractory pain. Consultation is also warranted for large kidney stones (≥10 mm in diameter) that are unlikely to pass without additional intervention (eg, lithotripsy). Most stones ≤5 mm pass spontaneously, and alpha blockers (eg, tamsulosin) can be used to facilitate passage (especially for intermediate-sized stones 6-10 mm).

Surgery Renal, Urinary Systems & Electrolytes Renal calculi

A 25-year-old man comes to the office due to right hand pain and swelling. He injured the skin over his right knuckles when he punched a man in the teeth during a bar fight 3 days ago. The patient ignored the wound initially, but his hand became more painful and swollen yesterday. He has no medical history and takes no medications. The patient received a tetanus toxoid vaccination at age 18. Temperature is 37.3 C (99.1 F), blood pressure is 120/70 mm Hg, and pulse is 78/min. There are small lacerations over the right third and fourth metacarpophalangeal joints with surrounding erythema, swelling, and tenderness. No discharge or crepitus is present. Hand radiographs reveal no foreign body or bone/joint changes. Cultures are obtained. Which of the following empiric antibiotics is most appropriate for this patient?

- A. Amoxicillin-clavulanate
- B. Ampicillin
- C. Ciprofloxacin
- D. Clindamycin
- E. Erythromycin

Submit

A 25-year-old man comes to the office due to right hand pain and swelling. He injured the skin over his right knuckles when he punched a man in the teeth during a bar fight 3 days ago. The patient ignored the wound initially, but his hand became more painful and swollen yesterday. He has no medical history and takes no medications. The patient received a tetanus toxoid vaccination at age 18. Temperature is 37.3 C (99.1 F), blood pressure is 120/70 mm Hg, and pulse is 78/min. There are small lacerations over the right third and fourth metacarpophalangeal joints with surrounding erythema, swelling, and tenderness. No discharge or crepitus is present. Hand radiographs reveal no foreign body or bone/joint changes. Cultures are obtained. Which of the following empiric antibiotics is most appropriate for this patient?

- ✓ A. Amoxicillin-clavulanate (58%)
- B. Ampicillin (3%)
- C. Ciprofloxacin (5%)
- D. Clindamycin (30%)
- E. Erythromycin (2%)

Omitted
Correct answer
A

58%
Answered correctly

01 sec
Time Spent

03/19/2020
Last Updated

Explanation

This patient experienced a bite wound from a clenched fist ("fight-bite") injury. **Human bite wounds** are prone to **polymicrobial infection** with aerobic and anaerobic oral flora. The most common organisms include streptococci, *Staphylococcus aureus*, *Eikenella corrodens*, *Haemophilus influenzae*, and beta-lactamase–producing anaerobic bacteria.

Patients often initially ignore a wound until **pain, swelling**, or purulent discharge develops. Blood and wound cultures should be sent; empiric

This patient experienced a bite wound from a clenched fist ("fight-bite") injury. **Human bite wounds** are prone to **polymicrobial infection** with aerobic and anaerobic oral flora. The most common organisms include streptococci, *Staphylococcus aureus*, *Eikenella corrodens*, *Haemophilus influenzae*, and beta-lactamase–producing anaerobic bacteria.

Patients often initially ignore a wound until **pain, swelling**, or purulent discharge develops. Blood and wound cultures should be sent; empiric antibiotics are required. Although large studies on empiric antibiotic selection for human bite wounds are scarce, **amoxicillin-clavulanate** is often the treatment of choice due to excellent coverage of gram-positive, gram-negative, and beta-lactamase–producing oral anaerobic organisms (as clavulanate is a beta-lactamase inhibitor). Surgical debridement is usually necessary, and wounds are typically left open to drain and heal by **secondary intention** (due to high infection risk with closure). Tetanus vaccination should be administered to those who are not up to date.

(Choice B) Ampicillin can be used for upper respiratory tract infections (eg, pharyngitis) and is effective against many gram-positive and gram-negative organisms. However, it does not provide coverage for beta-lactamase–producing flora and is often combined with the beta-lactamase inhibitor sulbactam in an intravenous formulation.

(Choice C) Ciprofloxacin covers many gram-negative organisms and some gram-positive organisms (excluding most streptococci), but it does not provide reliable coverage for anaerobic organisms. It is often used for genitourinary and gastrointestinal infections.

(Choice D) Clindamycin is effective against gram-positive bacteria and anaerobes but not against most gram-negative organisms (eg, *Eikenella corrodens*). It is used for some lung abscesses, skin and soft-tissue infections, and female upper reproductive tract infections (anaerobic coverage in combination with other agents).

(Choice E) Erythromycin is sometimes used as a second-line agent in the treatment of gonococcal or chlamydial urethritis. Erythromycin covers some atypical organisms (eg, *Mycoplasma*), but overall it does not provide adequate gram-negative or anaerobic coverage.

Educational objective:
Human bite wounds often result in polymicrobial infections with aerobic and anaerobic oral organisms. Empiric treatment with amoxicillin-clavulanate provides adequate coverage for the majority of virulent oral bacteria.

Surgery	Infectious Diseases	Animal and human bite injuries
Subject	System	Topic

aerobic and anaerobic oral flora. The most common organisms include streptococci, *Staphylococcus aureus*, *Eikenella corrodens*, *Haemophilus influenzae*, and beta-lactamase–producing anaerobic bacteria.

Patients often initially ignore a wound until **pain, swelling**, or purulent discharge develops. Blood and wound cultures should be sent; empiric antibiotics are required. Although large studies on empiric antibiotic selection for human bite wounds are scarce, **amoxicillin-clavulanate** is often the treatment of choice due to excellent coverage of gram-positive, gram-negative, and beta-lactamase–producing oral anaerobic organisms (as clavulanate is a beta-lactamase inhibitor). Surgical debridement is usually necessary, and wounds are typically left open to drain and heal by **secondary intention** (due to high infection risk with closure). Tetanus vaccination should be administered to those who are not up to date.

(Choice B) Ampicillin can be used for upper respiratory tract infections (eg, pharyngitis) and is effective against many gram-positive and gram-negative organisms. However, it does not provide coverage for beta-lactamase–producing flora and is often combined with the beta-lactamase inhibitor sulbactam in an intravenous formulation.

(Choice C) Ciprofloxacin covers many gram-negative organisms and some gram-positive organisms (excluding most streptococci), but it does not provide reliable coverage for anaerobic organisms. It is often used for genitourinary and gastrointestinal infections.

(Choice D) Clindamycin is effective against gram-positive bacteria and anaerobes but not against most gram-negative organisms (eg, *Eikenella corrodens*). It is used for some lung abscesses, skin and soft-tissue infections, and female upper reproductive tract infections (anaerobic coverage in combination with other agents).

(Choice E) Erythromycin is sometimes used as a second-line agent in the treatment of gonococcal or chlamydial urethritis. Erythromycin covers some atypical organisms (eg, *Mycoplasma*), but overall it does not provide adequate gram-negative or anaerobic coverage.

Educational objective:
Human bite wounds often result in polymicrobial infections with aerobic and anaerobic oral organisms. Empiric treatment with amoxicillin-clavulanate provides adequate coverage for the majority of virulent oral bacteria.

Surgery	Infectious Diseases	Animal and human bite injuries
Subject	System	Topic

Copyright © UWorld. All rights reserved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

A 42-year-old man comes to the office due to back pain. Yesterday, the patient was moving furniture when he suddenly had sharp, shooting pain in the lower back and buttocks that radiated down the back of the legs. He took acetaminophen and rested, but the pain was persistent. When the patient woke up today, his legs felt numb and weak, and he also had to strain to urinate. He has no chronic medical conditions and takes no medication. Vital signs are within normal limits. Physical examination shows lower lumbar spine tenderness on palpation. Bilateral lower extremity strength is 4/5, and ankle reflexes are absent bilaterally. Sensation to touch is decreased in the perineal region and buttocks. Straight leg raise testing is positive. Which of the following is the most appropriate next step in management of this patient?

A. Obtain MR imaging of the lumbosacral spine
B. Order plain radiographs of the lumbosacral spine
C. Prescribe nonsteroidal anti-inflammatory drugs and resume activity as tolerated
D. Recommend strict bed rest and lumbar support
E. Refer to physical therapy for graduated exercises

Submit

A 42-year-old man comes to the office due to back pain. Yesterday, the patient was moving furniture when he suddenly had sharp, shooting pain in the lower back and buttocks that radiated down the back of the legs. He took acetaminophen and rested, but the pain was persistent. When the patient woke up today, his legs felt numb and weak, and he also had to strain to urinate. He has no chronic medical conditions and takes no medication. Vital signs are within normal limits. Physical examination shows lower lumbar spine tenderness on palpation. Bilateral lower extremity strength is 4/5, and ankle reflexes are absent bilaterally. Sensation to touch is decreased in the perineal region and buttocks. Straight leg raise testing is positive. Which of the following is the most appropriate next step in management of this patient?

- ✓ A. Obtain MR imaging of the lumbosacral spine (89%)
- B. Order plain radiographs of the lumbosacral spine (6%)
- C. Prescribe nonsteroidal anti-inflammatory drugs and resume activity as tolerated (3%)
- D. Recommend strict bed rest and lumbar support (0%)
- E. Refer to physical therapy for graduated exercises (0%)

Omitted
Correct answer
A

89%
Answered correctly

02 secs
Time Spent

03/28/2020
Last Updated

Explanation

This patient's urinary difficulty, saddle anesthesia (decreased sensation in the buttocks/perineum), and bilateral lower extremity motor/sensory/reflex abnormalities raise strong suspicion for **cauda equina syndrome** (CES). Most cases arise when a **large, central lumbar disc herniation** at the L4-S1 level bulges into the lumbar cistern and compresses **multiple spinal nerve roots** in the cauda equina.

Injury to the cauda equina, which is composed of nerve roots for L2-L5, S1-S5, and the coccygeal nerve, usually results in **severe back pain**

This patient's urinary difficulty, saddle anesthesia (decreased sensation in the buttocks/perineum), and bilateral lower extremity motor/sensory/reflex abnormalities raise strong suspicion for **cauda equina syndrome** (CES). Most cases arise when a **large, central lumbar disc herniation** at the L4-S1 level bulges into the lumbar cistern and compresses **multiple spinal nerve roots** in the cauda equina.

Injury to the cauda equina, which is composed of nerve roots for L2-L5, S1-S5, and the coccygeal nerve, usually results in **severe back pain** radiating into one or both legs and loss of lower extremity motor strength, sensation, and reflexes in the affected dermatomes. **Saddle anesthesia** is highly suggestive of CES and reflects impingement of S2-S4 nerve roots; **bladder** (eg, urinary straining) **and rectal sphincter paralysis** can also occur due to damage to S3-S5 nerve roots. Loss of ankle reflex indicates damage to S1-S2 nerve roots.

Straight leg raise testing (worsened sciatic pain when straight leg is raised to 30-70 degrees) is positive in >90% of those with acute lumbar herniation and may aid diagnosis. Confirmation requires urgent **MRI of the lumbosacral spine**. Because patients with CES (particularly in the setting of bladder or rectal dysfunction) are at high risk for permanent neurologic sequelae, surgical decompression is then usually necessary.

(Choice B) A plain radiograph of the lumbosacral spine can diagnose degenerative disc disease or bone lesions. However, it does not allow clear enough visualization of the spinal canal and intravertebral discs to definitively rule out CES; lumbosacral spine MRI is considered the test of choice for diagnosis.

(Choices C, D, and E) Acute lumbosacral radiculopathy is usually caused by disc herniation and is marked by impingement of ≥1 lumbosacral nerve roots. Although patients often have low back pain that radiates into one or both legs (and may occasionally have dermatomal motor weakness or loss of reflex), other neurologic issues such as saddle anesthesia and bowel/bladder dysfunction are generally absent (in contrast to CES). Acute lumbosacral radiculopathy is typically managed with nonsteroidal anti-inflammatory drugs, acetaminophen, and activity modification to lessen pain. Physical therapy with graduated exercises may be recommended in some cases; prolonged bed rest and inactivity is not recommended and may worsen outcomes.

Educational objective:
Cauda equina syndrome is most common following a large lumbosacral disc herniation. Suspicion should be raised in those with severe low back pain radiating into one or both legs with accompanying saddle anesthesia (sensory change in the genitals/perineum) and/or bladder, bowel, or sexual dysfunction. An urgent lumbosacral spine MRI is required for diagnosis, followed by surgical decompression.

Injury to the cauda equina, which is composed of nerve roots for L2-L5, S1-S5, and the coccygeal nerve, usually results in **severe back pain** radiating into one or both legs and loss of lower extremity motor strength, sensation, and reflexes in the affected dermatomes. **Saddle anesthesia** is highly suggestive of CES and reflects impingement of S2-S4 nerve roots; **bladder** (eg, urinary straining) **and rectal sphincter paralysis** can also occur due to damage to S3-S5 nerve roots. Loss of ankle reflex indicates damage to S1-S2 nerve roots.

Straight leg raise testing (worsened sciatic pain when straight leg is raised to 30-70 degrees) is positive in >90% of those with acute lumbar herniation and may aid diagnosis. Confirmation requires urgent **MRI of the lumbosacral spine**. Because patients with CES (particularly in the setting of bladder or rectal dysfunction) are at high risk for permanent neurologic sequelae, surgical decompression is then usually necessary.

(Choice B) A plain radiograph of the lumbosacral spine can diagnose degenerative disc disease or bone lesions. However, it does not allow clear enough visualization of the spinal canal and intravertebral discs to definitively rule out CES; lumbosacral spine MRI is considered the test of choice for diagnosis.

(Choices C, D, and E) Acute lumbosacral radiculopathy is usually caused by disc herniation and is marked by impingement of ≥1 lumbosacral nerve roots. Although patients often have low back pain that radiates into one or both legs (and may occasionally have dermatomal motor weakness or loss of reflex), other neurologic issues such as saddle anesthesia and bowel/bladder dysfunction are generally absent (in contrast to CES). Acute lumbosacral radiculopathy is typically managed with nonsteroidal anti-inflammatory drugs, acetaminophen, and activity modification to lessen pain. Physical therapy with graduated exercises may be recommended in some cases; prolonged bed rest and inactivity is not recommended and may worsen outcomes.

Educational objective:
Cauda equina syndrome is most common following a large lumbosacral disc herniation. Suspicion should be raised in those with severe low back pain radiating into one or both legs with accompanying saddle anesthesia (sensory change in the genitals/perineum) and/or bladder, bowel, or sexual dysfunction. An urgent lumbosacral spine MRI is required for diagnosis, followed by surgical decompression.

Surgery	Nervous System	Cauda equina syndrome
Subject	System	Topic

Copyright © UWorld. All rights reserved.

A 24-year-old man comes to the office due to vision disturbances. The patient has a history of ankylosing spondylitis and experienced severe pain and redness of the eyes a month ago. Evaluation at that time showed acute anterior uveitis and prednisolone eye drops were prescribed, which the patient still uses. The eye symptoms resolved within a week of treatment, but over the past several days the patient has had blurry vision and has needed more light to read. He has also experienced glare while driving at night. The patient has no other medical conditions, and his only other prescribed medication is naproxen as needed. Vital signs are within normal limits. Ocular examination shows nonerythematous conjunctiva, clear corneas, and no hypopyon or opacities of the lenses. Funduscopic examination is normal. The remainder of the physical examination, including neurologic examination, shows no abnormalities. Which of the following is the most appropriate next step in management of this patient?

A. Fluorescein eye stain
B. Lumbar puncture
C. MRI of the brain
D. No further intervention
E. Tonometry

Submit

A 24-year-old man comes to the office due to vision disturbances. The patient has a history of ankylosing spondylitis and experienced severe pain and redness of the eyes a month ago. Evaluation at that time showed acute anterior uveitis and prednisolone eye drops were prescribed, which the patient still uses. The eye symptoms resolved within a week of treatment, but over the past several days the patient has had blurry vision and has needed more light to read. He has also experienced glare while driving at night. The patient has no other medical conditions, and his only other prescribed medication is naproxen as needed. Vital signs are within normal limits. Ocular examination shows nonerythematous conjunctiva, clear corneas, and no hypopyon or opacities of the lenses. Funduscopic examination is normal. The remainder of the physical examination, including neurologic examination, shows no abnormalities. Which of the following is the most appropriate next step in management of this patient?

- A. Fluorescein eye stain (22%)
- B. Lumbar puncture (0%)
- C. MRI of the brain (7%)
- D. No further intervention (17%)
- ✓ E. Tonometry (51%)

Omitted
Correct answer
E

51%
Answered correctly

02 secs
Time Spent

03/13/2020
Last Updated

Explanation

This patient has developed impaired vision while receiving glucocorticoid eyedrops (ie, prednisolone), suggesting possible steroid-induced **open-angle glaucoma (OAG)**. OAG is a type of optic neuropathy associated with increased **intraocular pressure** (IOP). Topical **glucocorticoid**

This patient has developed impaired vision while receiving glucocorticoid eyedrops (ie, prednisolone), suggesting possible steroid-induced **open-angle glaucoma (OAG)**. OAG is a type of optic neuropathy associated with increased **intraocular pressure** (IOP). Topical **glucocorticoid eyedrops** and systemic glucocorticoids can raise IOP due to decreased outflow of aqueous humor via drainage channels in the anterior chamber, possibly worsened by the swelling of structures (eg, choroid, lens) in the posterior chamber.

OAG is characterized by insidious loss of **peripheral vision** related to atrophy of the optic nerve head; signs include enlargement of the optic cup and increased cup/disc ratio (ie, "cupping" of the optic disc), but this is a late finding and may not be immediately apparent. However, patients with steroid-induced OAG may also develop central blurriness early in the course due to **corneal edema**. Chronic use of glucocorticoids can also cause subcapsular cataracts, although this is not yet seen in this patient.

Elevated IOP in OAG can be documented with tonometry. **Tonometry** measures deformation of the cornea in response to applied (mechanical or pneumatic) pressure. Patients with suspected OAG should also receive assessment of peripheral fields using automated test devices (manual visual field testing by opposition has low sensitivity for OAG).

(Choice A) Fluorescein dye can be instilled onto the surface of the eye to facilitate inspection of the cornea in patients with an ocular foreign body, corneal abrasion, or keratitis. These conditions are typically associated with eye pain, irritation, tearing, or redness.

(Choice B) Lumbar puncture for spinal fluid analysis is useful for assessing subarachnoid hemorrhage (eg, thunderclap headache, meningeal signs) or meningitis (eg, headache, fever, neck stiffness). This patient has painless vision loss and a normal neurologic examination, and spinal fluid analysis is not needed.

(Choice C) MRI of the brain can detect signs of multiple sclerosis, which can cause ocular symptoms due to optic neuritis. However, optic neuritis presents with ocular pain, acute vision loss, and an afferent pupillary defect.

(Choice D) Untreated steroid-induced OAG can lead to permanent vision loss and therefore needs careful confirmation. Observation without testing is not appropriate.

Educational objective:
Topical glucocorticoid eyedrops and systemic glucocorticoids can raise intraocular pressure (IOP), leading to open-angle glaucoma (OAG). OAG is usually characterized by insidious loss of peripheral vision, and some patients with steroid-induced OAG may develop central blurriness due to

cause subcapsular cataracts, although this is not yet seen in this patient.

Elevated IOP in OAG can be documented with tonometry. **Tonometry** measures deformation of the cornea in response to applied (mechanical or pneumatic) pressure. Patients with suspected OAG should also receive assessment of peripheral fields using automated test devices (manual visual field testing by opposition has low sensitivity for OAG).

(Choice A) Fluorescein dye can be instilled onto the surface of the eye to facilitate inspection of the cornea in patients with an ocular foreign body, corneal abrasion, or keratitis. These conditions are typically associated with eye pain, irritation, tearing, or redness.

(Choice B) Lumbar puncture for spinal fluid analysis is useful for assessing subarachnoid hemorrhage (eg, thunderclap headache, meningeal signs) or meningitis (eg, headache, fever, neck stiffness). This patient has painless vision loss and a normal neurologic examination, and spinal fluid analysis is not needed.

(Choice C) MRI of the brain can detect signs of multiple sclerosis, which can cause ocular symptoms due to optic neuritis. However, optic neuritis presents with ocular pain, acute vision loss, and an afferent pupillary defect.

(Choice D) Untreated steroid-induced OAG can lead to permanent vision loss and therefore needs careful confirmation. Observation without testing is not appropriate.

Educational objective:
Topical glucocorticoid eyedrops and systemic glucocorticoids can raise intraocular pressure (IOP), leading to open-angle glaucoma (OAG). OAG is usually characterized by insidious loss of peripheral vision, and some patients with steroid-induced OAG may develop central blurriness due to corneal edema. IOP can be measured with tonometry.

References

- Steroid-induced glaucoma: an avoidable irreversible blindness.

Surgery	Ophthalmology	Glaucoma
Subject	System	Topic

Copyright © UWorld. All rights reserved.