

# Abnormal Changes of Pregnancy

Topic- based Uworld Questions

Block 1, 2, 7, 8



A 24-year-old primigravida with a twin pregnancy at 30 weeks gestation comes to the emergency department due to severe epigastric and right upper quadrant pain. The patient first developed the pain yesterday morning after eating breakfast. She took acetaminophen and an antacid but had no relief. She now has severe stabbing pain, has vomited 7 times today, and continues to have nausea. The patient has no chronic medical conditions or previous surgeries. Temperature is 37.2 C (99 F), blood pressure is 136/86 mm Hg, and pulse is 108/min. BMI is 23 kg/m<sup>2</sup>. Fetal heart rate monitoring shows 2 fetal heart rates with baselines of 160/min and moderate variability. The patient appears pale and has scleral icterus. The abdomen has tenderness to palpation over the right upper quadrant and epigastric region, but no rebound. The uterus is nontender and has no palpable contractions.

#### Complete blood count

Hemoglobin	9.6 g/dL
Platelets	60,000/mm <sup>3</sup>
Leukocytes	24,000/mm <sup>3</sup>

#### Serum chemistry

Creatinine	1.4 mg/dL
Glucose	48 mg/dL

#### Liver function studies

Total bilirubin	5.3 mg/dL
Alkaline phosphatase	170 U/L
Aspartate aminotransferase (SGOT)	87 U/L
Alanine aminotransferase (SGPT)	99 U/L

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Alanine aminotransferase (SGPT) 95  Add To New Card  Add To Existing Card

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

- A. 24-hour urine protein collection
- B. Emergency cholecystectomy
- C. Immediate delivery
- D. MRI of the abdomen
- E. Ultrasound-guided liver biopsy

**Submit**

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Creatinine 1.4 mg/dL

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

- A. 24-hour urine protein collection (5%)
- B. Emergency cholecystectomy (25%)
- C. Immediate delivery (61%)
- D. MRI of the abdomen (5%)
- E. Ultrasound-guided liver biopsy (1%)

Omitted

Correct answer



61%

Answered correctly



04 secs

Time Spent



04/18/2020

Last Updated

Acute fatty liver of pregnancy	
<b>Clinical features</b>	<ul style="list-style-type: none"> <li>• Nausea, vomiting</li> <li>• Right upper quadrant/epigastric pain</li> <li>• Fulminant liver failure</li> </ul>
<b>Laboratory findings</b>	<ul style="list-style-type: none"> <li>• Profound hypoglycemia</li> <li>• ↑ Aminotransferases (2-3x normal)</li> <li>• ↑ Bilirubin</li> <li>• Thrombocytopenia</li> <li>• Disseminated intravascular coagulopathy</li> </ul>
<b>Management</b>	<ul style="list-style-type: none"> <li>• Immediate delivery</li> </ul>

This patient has **acute fatty liver of pregnancy (AFLP)**, a rare but life-threatening condition that develops in the third trimester, particularly in patients with multiple gestation. AFLP is an intrinsic hepatic disease likely due to defective maternal-fetal fatty acid metabolism. It causes hepatic inflammation (eg, epigastric/right upper quadrant pain, leukocytosis, elevated aminotransferases) and subsequent **fulminant liver failure** (eg, scleral icterus, hyperbilirubinemia, **profound hypoglycemia**). As AFLP progresses, patients can develop multiorgan system failure, including **disseminated intravascular coagulopathy** (eg, hemolytic anemia, thrombocytopenia) and acute kidney injury (from hepatorenal syndrome).

As the mother decompensates, the placenta hypoperfuses, which can result in fetal hypoxemia, acidosis, and subsequent death. Due to **high maternal and fetal mortality rates**, management of AFLP is with maternal stabilization and **immediate delivery**, regardless of gestational age.

**(Choice A)** A 24-hour urine protein test evaluates for preeclampsia with severe features, which may also present in the third trimester with right upper quadrant pain and signs of end-organ damage (eg, elevated creatinine). This patient does not have hypertension (ie, systolic  $\geq 140$  mm Hg or diastolic  $\geq 90$  mm Hg), making this diagnosis less likely.

**(Choice B)** Emergency cholecystectomy is performed for complicated acute cholecystitis (ie, gallbladder perforation or gangrene), which may

This patient has **acute fatty liver of pregnancy (AFLP)**, a rare but life-threatening condition that develops in the third trimester, particularly in patients with multiple gestation. AFLP is an intrinsic hepatic disease likely due to defective maternal-fetal fatty acid metabolism. It causes hepatic inflammation (eg, epigastric/right upper quadrant pain, leukocytosis, elevated aminotransferases) and subsequent **fulminant liver failure** (eg, scleral icterus, hyperbilirubinemia, **profound hypoglycemia**). As AFLP progresses, patients can develop multiorgan system failure, including **disseminated intravascular coagulopathy** (eg, hemolytic anemia, thrombocytopenia) and acute kidney injury (from hepatorenal syndrome).

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**(Choice B)** Emergency cholecystectomy is performed for complicated acute cholecystitis (ie, gallbladder perforation or gangrene), which may present with postprandial right upper quadrant pain and an elevated alkaline phosphatase level. Acute cholecystitis does not cause hyperbilirubinemia or profound hypoglycemia. In addition, the source of this patient's elevated alkaline phosphatase level is likely the placenta.

**(Choices D and E)** MRI and ultrasound are preferred imaging modalities in pregnancy due to low risk of fetal radiation exposure; they are performed in patients with an uncertain diagnosis. Neither is required to diagnose AFLP, and delaying delivery increases fetal and maternal mortality. Liver biopsy is not needed for the diagnosis of AFLP and increases this patient's bleeding risk due to thrombocytopenia and possible coagulopathy from liver dysfunction.

#### Educational objective:

Acute fatty liver of pregnancy presents in the third trimester with hepatic inflammation (eg, epigastric/right upper quadrant pain, leukocytosis, elevated aminotransferases) and fulminant liver failure (eg, profound hypoglycemia). Due to high maternal and fetal mortality rates, management is immediate delivery.

#### References

- [Acute fatty liver disease of pregnancy: updates in pathogenesis, diagnosis, and management.](#)

A 36-year-old woman, gravida 1 para 0, at 32 weeks gestation comes to the emergency department due to right upper quadrant pain. For the past week, the patient has had intermittent right upper quadrant pain that radiates to the back and resolves within a few hours. The pain has become progressively worse and is now occurring multiple times a day. She has also had increasing dyspnea and fatigue but has had no fever, cough, or headaches. The patient has no chronic medical conditions and has had no surgeries. Temperature is 36.7 C (98 F), blood pressure is 136/84 mm Hg, and pulse is 88/min. BMI is 40 kg/m<sup>2</sup>. Fetal heart rate tracing shows a baseline of 150/min with moderate variability and no decelerations. Cardiac examination reveals a 2/6 midsystolic murmur. The lungs are clear bilaterally. There is tenderness to deep palpation in the right upper quadrant and epigastrium but no palpable mass. The uterus is nontender. Bilateral lower extremities have 1+ pitting edema to the midcalves. Which of the following is the most likely cause of this patient's symptoms?

- A. Intermittent obstruction of the cystic duct
- B. Obstruction and inflammation of the appendix
- C. Passive congestion of the liver
- D. Premature separation of the placenta
- E. Rupture of a hepatic adenoma
- F. Stretching of the liver capsule

Submit

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- A. Intermittent obstruction of the cystic duct (69%)
- B. Obstruction and inflammation of the appendix (1%)
- C. Passive congestion of the liver (8%)
- D. Premature separation of the placenta (0%)
- E. Rupture of a hepatic adenoma (0%)
- F. Stretching of the liver capsule (20%)

Omitted

Correct answer

A

69%  
Answered correctly02 secs  
Time Spent04/01/2020  
Last Updated

Explanation



Symptomatic cholelithiasis in pregnancy	
<b>Pathophysiology</b>	<ul style="list-style-type: none"><li>• ↑ Biliary cholesterol excretion (estrogen)</li><li>• ↓ Gallbladder motility (progesterone)</li></ul>
<b>Clinical features</b>	<ul style="list-style-type: none"><li>• Recurrent, postprandial epigastric/RUQ pain</li><li>• RUQ ultrasound with echogenic foci (stones or sludge)</li></ul>
<b>Management</b>	<ul style="list-style-type: none"><li>• Conservative (eg, pain control)</li><li>• Cholecystectomy (for complicated, recurrent cases)</li></ul>

RUQ = right upper quadrant.

This patient's intermittent right upper quadrant (RUQ) pain (ie, **biliary colic**) is most likely due to **symptomatic cholelithiasis**. **Pregnant women** (particularly those with concomitant obesity) are at increased risk for symptomatic cholelithiasis because they have elevated estrogen levels, which increases cholesterol excretion into bile, and elevated progesterone levels, which decreases gallbladder motility and emptying. As gallstones form and become too large to pass through the cystic duct, they **intermittently obstruct the cystic duct** when the gallbladder contracts (eg, with fatty meals). This obstruction causes increased intraluminal pressure, leading to the characteristic **intermittent RUQ pain** that can radiate to the back.

Diagnosis is confirmed with RUQ ultrasound, which may show gallstones or biliary sludge (appearing as echogenic foci within the gallbladder). Management during pregnancy is conservative because most cases resolve with supportive care (eg, pain control). Cholecystectomy is usually delayed until the postpartum period.

**(Choice B)** Obstruction and inflammation of the appendix (ie, acute appendicitis) can present with RUQ pain during the third trimester due to displacement of the appendix by the uterus. Patients with acute appendicitis typically have acute-onset, constant pain (rather than intermittent) and signs of inflammation (eg, fever).

**(Choice C)** Passive liver congestion can cause RUQ pain in patients with decompensated right heart failure. Peripartum cardiomyopathy, which

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**(Choice C)** Passive liver congestion can cause RUQ pain in patients with decompensated right heart failure. Peripartum cardiomyopathy, which primarily causes left-sided heart failure, can lead to secondary right-sided failure. This patient has no signs of left-sided heart failure (ie, no pulmonary edema), making this diagnosis unlikely. Dyspnea, a midsystolic murmur (due to physiologic changes in flow), and 1+ pitting edema are normal in pregnancy.

**(Choice D)** Premature separation of the placenta (ie, placental abruption) presents with diffuse abdominal pain rather than focal RUQ pain. In addition, patients have uterine tenderness and fetal decelerations, which are not seen in this patient.

**(Choice E)** Hepatic adenomas are benign liver tumors associated with high estrogen levels (eg, pregnancy, combination oral contraceptive use). Ruptured hepatic adenomas can cause RUQ pain; however, patients have acute onset of pain, a possible palpable liver mass, and hemodynamic instability (eg, hypotension, tachycardia) due to intraabdominal bleeding.

**(Choice F)** Preeclampsia can cause RUQ pain due to stretching of the liver capsule; however, this diagnosis is unlikely in patients without hypertension (ie, systolic  $\geq 140$  mm Hg or diastolic  $\geq 90$  mm Hg).

#### Educational objective:

Symptomatic cholelithiasis (biliary colic) is common in pregnancy due to increased gallstone formation. Patients have recurrent right upper quadrant and/or epigastric pain from intermittent obstruction of the cystic duct.

#### References

- [Cholesterol cholelithiasis in pregnant women: pathogenesis, prevention and treatment.](#)

A 23-year-old primigravida at 29 weeks gestation comes to the emergency department with sudden-onset severe shortness of breath. She woke up today with a fluttering sensation in her chest, which progressed to significant dyspnea, dry cough, and an inability to lie flat. Recently, the patient has had some exercise intolerance and tiredness, which she attributes to pregnancy. Her medical history is significant for recurrent sore throat requiring tonsillectomy as a child. She is a lifetime nonsmoker and does not use alcohol. The patient's lifestyle is mostly sedentary. She immigrated to the United States from India 5 years ago. Her blood pressure is 110/60 mm Hg and pulse is 144/min. The patient appears uncomfortable. An ECG shows atrial fibrillation with rapid ventricular response. Which of the following is the most likely diagnosis?

- A. Aortic insufficiency
- B. Constrictive pericarditis
- C. Hypertrophic cardiomyopathy
- D. Mitral stenosis
- E. Myocardial infarction
- F. Peripartum cardiomyopathy

Submit



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- A. Aortic insufficiency (2%)
- B. Constrictive pericarditis (4%)
- C. Hypertrophic cardiomyopathy (1%)
- D. Mitral stenosis (61%)
- E. Myocardial infarction (0%)
- F. Peripartum cardiomyopathy (29%)

Omitted  
Correct answer  
D

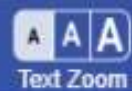
61%  
Answered correctly

02 secs  
Time Spent

07/01/2020  
Last Updated

Explanation

This patient's clinical presentation - cough, progressive dyspnea, and orthopnea - is consistent with pulmonary edema with rapid decompensation due to development of new atrial fibrillation (AF) with rapid ventricular response (RVR). Her history of recurrent sore throat and origin from a



This patient's clinical presentation - cough, progressive dyspnea, and orthopnea - is consistent with pulmonary edema with rapid decompensation due to development of new atrial fibrillation (AF) with rapid ventricular response (RVR). Her history of recurrent sore throat and origin from a country with high incidence of rheumatic heart disease make rheumatic mitral stenosis the most likely diagnosis.

**Rheumatic mitral stenosis** is an insidious progressive disease, and patients can remain asymptomatic for several years. During **pregnancy**, physiologic increases in heart rate and blood volume raise the transmitral gradient and left atrial pressure (at rest and during exercise). As seen in this patient, these changes often precipitate **symptoms** of fatigue, exercise intolerance, or dyspnea in previously asymptomatic patients with rheumatic mitral stenosis. These patients are also at increased risk of developing AF. The loss of an effective "atrial kick" and decrease in diastolic filling times seen with AF and RVR (ie, pulse >100/min) further increases left atrial pressure, with dramatic worsening of pulmonary congestion and pulmonary edema.

**(Choice A)** Aortic insufficiency can result from rheumatic heart disease and present with heart failure and AF, but it is less common than mitral stenosis in women of childbearing age.

**(Choice B)** Constrictive pericarditis presents as predominant right heart failure with elevated jugular venous pressure, hepatomegaly, ascites, and peripheral edema. Symptoms can be exacerbated during pregnancy due to increased blood volume and hypervolemia.

**(Choice C)** Hypertrophic cardiomyopathy (HCM) is an autosomal dominant disorder of cardiac sarcomere characterized by asymmetric left ventricular hypertrophy. Symptoms are attributed to dynamic left ventricular outflow tract (LVOT) obstruction, and dehydration and hypovolemia worsen LVOT obstruction and symptoms. Conversely, hypervolemia with pregnancy would be expected to reduce symptoms attributed to LVOT obstruction. HCM should be distinguished from hypertrophy due to other cardiovascular heart diseases (eg, hypertension, valvular, ischemic).

**(Choice E)** Myocardial infarction is unlikely in a young woman with no other risk factors for coronary artery disease and with an ECG showing no ischemic changes.

**(Choice F)** Peripartum cardiomyopathy (PPCM) causes rapid-onset systolic heart failure (fatigue, dyspnea, cough, pedal edema) at >36 weeks gestation or the early puerperium. This patient's medical and social history and symptom onset before 36 weeks gestation makes mitral stenosis more likely than PPCM. Also, AF with RVR is relatively rare in PPCM.

**Educational objective:**

congestion and pulmonary edema.

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#### Educational objective:

Rheumatic mitral stenosis is an insidious progressive disease, and physiologic and hemodynamic changes during pregnancy can precipitate symptoms in previously asymptomatic patients. The development of new atrial fibrillation can further increase transmitral gradient and left atrial pressure, with dramatic worsening of pulmonary congestion and pulmonary edema.

#### References

- [Management of severe mitral stenosis during pregnancy.](#)

A 37-year-old primigravida at 14 weeks gestation comes to the office for an initial prenatal visit. She has had some nausea but no vomiting, abdominal pain, or vaginal bleeding. The patient has type 2 diabetes mellitus and hypertension. She used to drink 1 or 2 glasses of wine a night but quit a year ago in anticipation of becoming pregnant. Temperature is 37.5 C (99.5 F), blood pressure is 138/88 mm Hg, pulse is 85/min, and respirations are 14/min. BMI is 36 kg/m<sup>2</sup>. On examination, the sclerae are anicteric. Cardiopulmonary examination is normal. The abdomen is nontender, and the liver edge is palpated 3 cm below the right costal margin. Laboratory results are as follows:

#### Complete blood count

Hemoglobin	12.5 g/dL
Platelets	225,000/mm <sup>3</sup>
Leukocytes	5,000/mm <sup>3</sup>

#### Liver function studies

Albumin	3.5 g/dL
Total bilirubin	1.0 mg/dL
Alkaline phosphatase	145 U/L (normal: 17-88)
Aspartate aminotransferase (SGOT)	115 U/L
Alanine aminotransferase (SGPT)	125 U/L

A right upper quadrant ultrasound reveals a hyperechoic-appearing liver, several gallstones without gallbladder wall thickening, and a normal-appearing common bile duct. Which of the following is the most likely cause of this patient's abnormal liver studies?

- A. Acute fatty liver of pregnancy
- B. Alcoholic hepatitis

Leukocytes 5,000/mm<sup>3</sup>

Liver function studies

Albumin 3.5 g/dL

Total bilirubin 1.0 mg/dL

Alkaline phosphatase 145 U/L (normal: 17-88)

Aspartate aminotransferase (SGOT) 115 U/L

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- A. Acute fatty liver of pregnancy
- B. Alcoholic hepatitis
- C. Gallstone disease
- D. Intrahepatic cholestasis of pregnancy
- E. Nonalcoholic fatty liver disease
- F. Preeclampsia

Submit



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Albumin 3.5 g/dL

Total bilirubin 1.0 mg/dL

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A right upper quadrant ultrasound reveals a hyperechoic-appearing liver, several gallstones without gallbladder wall thickening, and a normal-appearing common bile duct. Which of the following is the most likely cause of this patient's abnormal liver studies?

- A. Acute fatty liver of pregnancy (16%)
- B. Alcoholic hepatitis (1%)
- C. Gallstone disease (9%)
- D. Intrahepatic cholestasis of pregnancy (31%)
- E. Nonalcoholic fatty liver disease (40%)
- F. Preeclampsia (0%)

Omitted

Correct answer



40%  
Answered correctly



03 secs  
Time Spent



01/27/2020  
Last Updated



Explanation

Nonalcoholic fatty liver disease	
<b>Definition</b>	<ul style="list-style-type: none"> <li>• Hepatic steatosis on imaging or biopsy</li> <li>• Exclusion of significant alcohol use</li> <li>• Exclusion of other causes of fatty liver</li> </ul>
<b>Clinical features</b>	<ul style="list-style-type: none"> <li>• Mostly asymptomatic</li> <li>• Metabolic syndrome</li> <li>• ± Steatohepatitis (AST/ALT ratio &lt;1)</li> <li>• Hyperechoic texture on ultrasound</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• Diet &amp; exercise</li> <li>• Consider bariatric surgery if BMI ≥35</li> </ul>

ALT = alanine aminotransferase; AST = aspartate aminotransferase.

This patient with type 2 diabetes mellitus, obesity, and elevated aminotransferases most likely has **nonalcoholic fatty liver disease** (NAFLD). Risk factors for NAFLD include **type 2 diabetes mellitus, obesity, dyslipidemia, and metabolic syndrome**. **Insulin resistance** causes unregulated hepatic triglyceride synthesis, peripheral lipolysis, and free fatty acid uptake into the liver—all of which promote hepatic fat deposition (ie, hepatic steatosis).

Most patients (such as this one) are asymptomatic; some may have hepatomegaly on examination or minimal right upper quadrant pain. Laboratory findings include elevated aminotransferases (usually 2-5 times the upper limit of normal) with an **AST/ALT ratio <1**. An ultrasound is performed to help confirm the diagnosis and usually demonstrates a **hyperechoic-appearing liver**, which reflects hepatic fatty infiltration.

As NAFLD progresses, steatohepatitis can occur, putting patients at risk for liver fibrosis and cirrhosis. The mainstay of therapy is weight loss, which can reverse NAFLD-related liver damage.

**(Choices A and F)** Acute fatty liver of pregnancy (AFLP) and preeclampsia with severe features are causes of elevated aminotransferases in

(ie, hepatic steatosis).

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As NAFLD progresses, steatohepatitis can occur, putting patients at risk for liver fibrosis and cirrhosis. The mainstay of therapy is weight loss, which can reverse NAFLD-related liver damage.

**(Choices A and F)** Acute fatty liver of pregnancy (AFLP) and preeclampsia with severe features are causes of elevated aminotransferases in pregnant women. However, in contrast to this patient, those with AFLP or preeclampsia typically develop acute right upper quadrant pain and associated thrombocytopenia in the third trimester.

**(Choice B)** Alcoholic hepatitis is characterized by AST predominance (AST/ALT ratio of 2:1) and is unlikely with light to moderate alcohol intake (<15 drinks/week for men, <10 drinks/week for women).

**(Choice C)** Gallstones commonly develop in pregnancy because elevated progesterone levels inhibit gallbladder contraction and promote gallstone formation. Although gallstone formation increases the risk for cholecystitis and ascending cholangitis, patients typically have fever, leukocytosis, abdominal pain, and gallbladder wall thickening in addition to elevated aminotransferases.

**(Choice D)** Intrahepatic cholestasis of pregnancy can cause elevated aminotransferase levels. However, patients typically have generalized pruritus that is worse on the palms and soles in addition to elevated total bilirubin levels, making this diagnosis unlikely.

#### Educational objective:

Nonalcoholic fatty liver disease typically presents in patients with type 2 diabetes mellitus, obesity, and elevated aminotransferases with an AST/ALT ratio <1.

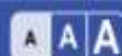
#### References

- [The diagnosis and management of nonalcoholic fatty liver disease: practice guidance from the American Association for the Study of Liver Diseases.](#)

Six days after a cesarean delivery, a 25-year-old woman comes to the emergency department with nausea, vomiting, and abdominal pain. The patient developed a sharp, right-sided abdominal pain 12 hours ago that has been increasing in severity, and she now has persistent nausea and vomiting. She has had no sick contacts, hematemesis, dysuria, or hematuria. Her last bowel movement was yesterday, with no blood in the stool. The patient has no chronic medical conditions and has had no other surgeries. Temperature is 38.3 C (101 F), blood pressure is 110/70 mm Hg, pulse is 98/min, and respirations are 18/min. The surgical incision has minimal serosanguineous discharge with no associated fluctuance or mass. Abdominal examination shows tenderness over the right lower quadrant. There is guarding and rebound tenderness. Bowel sounds are decreased. Speculum examination shows no purulent discharge. The uterus is 14-week sized and nontender. Hemoglobin is 9.6 g/dL and leukocyte count is 21,000/mm<sup>3</sup>. Which of the following is the most likely diagnosis in this patient?

- A. Acute appendicitis
- B. Endometritis
- C. Fascial dehiscence
- D. Septic pelvic thrombophlebitis
- E. Strangulated incisional hernia
- F. Uterine incarceration

Submit



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- A. Acute appendicitis (63%)
- B. Endometritis (9%)
- C. Fascial dehiscence (3%)
- D. Septic pelvic thrombophlebitis (15%)
- E. Strangulated incisional hernia (4%)
- F. Uterine incarceration (3%)

Omitted

Correct answer

A



63%

Answered correctly



01 sec

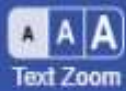
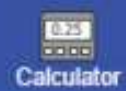
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04/06/2020

Last Updated

Explanation



Acute appendicitis	
<b>Clinical presentation</b>	<ul style="list-style-type: none"> <li>• Nausea, vomiting, anorexia</li> <li>• Initially: diffuse abdominal pain (visceral pain)</li> <li>• Later: localized RLQ pain (somatic pain)</li> <li>• Mild leukocytosis</li> </ul>
<b>Examination</b>	<ul style="list-style-type: none"> <li>• McBurney point tenderness</li> <li>• Psoas sign: pain with right hip extension</li> <li>• Obturator sign: pain with right hip internal rotation</li> <li>• Rovsing sign: RLQ pain with LLQ palpation</li> </ul>
<b>Diagnosis</b>	<ul style="list-style-type: none"> <li>• Clinical presentation</li> <li>• CT scan or ultrasound</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• Surgical appendectomy</li> </ul>

LLQ = left lower quadrant; RLQ = right lower quadrant.

This postpartum patient with **right-sided abdominal pain** most likely has **acute appendicitis**. Acute appendicitis develops after obstruction of the appendiceal lumen from a fecalith, cancer, or lymphoid follicular hyperplasia. The obstruction increases appendiceal intraluminal pressure, which occludes blood flow and results in ischemia. Patients initially develop referred periumbilical pain; in patients with recent abdominal surgery (eg, cesarean delivery), this pain may be masked. As ischemia progresses, patients develop systemic (eg, **fever**, leukocytosis) and localized (eg, right lower quadrant pain, **rebound**, **guarding**) signs of inflammation.

**Atypical presentations** of appendicitis can occur **postpartum** due to displacement of the appendix by the enlarged uterus. Imaging can confirm the diagnosis. Treatment is with appendectomy.

**(Choices B and D)** Postpartum endometritis presents with fever and abdominal pain; however, it also causes uterine tenderness, purulent lochia, and heavy vaginal bleeding (not seen in this patient). Septic pelvic thrombophlebitis is a rare diagnosis associated with endometritis and is

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**(Choices C and E)** Patients with a fascial dehiscence or a strangulated incisional hernia can present postoperatively with nausea and abdominal pain. However, patients usually have copious serosanguineous discharge and either an incisional bulge or fluctuant mass (ie, bowel).

**(Choice F)** Uterine incarceration is a rare disorder that occurs during pregnancy as a retroverted uterus enlarges and the fundus becomes entrapped under the sacral promontory. Patients have pelvic pain and urinary retention due to bladder obstruction. Uterine incarceration does not occur postpartum because the uterus becomes progressively smaller and therefore unlikely to become entrapped.

#### Educational objective:

Acute appendicitis typically presents with fever, nausea, vomiting, and right lower quadrant pain. Diagnosis of acute appendicitis is mainly clinical, but atypical presentations can occur postpartum due to displacement of the appendix by the enlarged uterus. Treatment is with appendectomy.

#### References

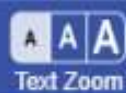
- [Appendicitis in postpartum period: a diagnostic challenge.](#)

A 28-year-old woman, gravida 1 para 0, at 30 weeks gestation comes to the office due to burning pain in her right hand. The pain is mild and intermittent but worse at night and is felt mainly over the first, second, and third digits. Shaking the hands or letting them hang down briefly relieves the pain. There is no associated neck or forearm pain. Her pregnancy has otherwise been uncomplicated. The patient does not use tobacco, alcohol, or illicit drugs. Vital signs are normal. Fetal heart tones are 160/min. On examination, there is no thenar or hypothenar atrophy, and thumb opposition is normal. Percussion over the volar aspect of the wrist reproduces the pain. Which of the following is the best next step in management of this patient?

- A. Acetaminophen
- B. Decompression surgery
- C. Local glucocorticoid injection
- D. No treatment until after delivery
- E. Wrist splinting

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- A. Acetaminophen (11%)
- B. Decompression surgery (2%)
- C. Local glucocorticoid injection (5%)
- D. No treatment until after delivery (9%)
- E. Wrist splinting (70%)

Omitted  
Correct answer  
E

 70%  
Answered correctly

 02 secs  
Time Spent

 01/28/2020  
Last Updated

Explanation

Carpal tunnel syndrome

Carpal tunnel syndrome	
<b>Risk factors</b>	<ul style="list-style-type: none"> <li>• Obesity</li> <li>• Pregnancy</li> <li>• Diabetes</li> <li>• Hypothyroidism</li> <li>• Rheumatoid arthritis</li> <li>• End-stage renal disease/hemodialysis</li> </ul>
<b>Clinical presentation</b>	<ul style="list-style-type: none"> <li>• Pain &amp; paresthesia in <b>median nerve</b> distribution (first 3½ digits)</li> <li>• Positive Phalen test &amp; Tinel sign</li> <li>• <b>Severe disease:</b> weakness of thumb abduction &amp; opposition, atrophy of thenar eminence</li> </ul>
<b>Confirmatory test</b>	<ul style="list-style-type: none"> <li>• Nerve conduction studies</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• Wrist splinting</li> <li>• Glucocorticoid injection</li> <li>• Surgery for severe or refractory symptoms</li> </ul>

This patient has hand pain in the distribution of the median nerve consistent with **carpal tunnel syndrome** (CTS). CTS is caused by compression of the median nerve where it passes under the transverse carpal ligament (flexor retinaculum) in the wrist, and is common in the third trimester of pregnancy due to hormonal changes and edema in the tunnel. The diagnosis is typically made on clinical grounds; maneuvers that increase compression of the nerve (eg, [Phalen test](#), [Tinel sign](#)) can reproduce the symptoms and clarify the diagnosis.

Most patients with mild CTS respond to conservative measures, including **nocturnal wrist splinting**. Splinting holds the wrist in a neutral position and prevents excessive flexion during sleep, lowering pressure within the tunnel. In most cases, CTS **resolves spontaneously after childbirth**, and additional treatment is often not necessary.

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**(Choice A)** Acetaminophen is safe for use in pregnancy and may provide transient relief of pain. However, it would not address the underlying pathology of the disorder or provide long-term relief. Nonsteroidal anti-inflammatory drugs (eg, ibuprofen) at best provide only transient relief and are generally avoided in pregnancy.

**(Choices B and C)** Local glucocorticoid injection is safe and effective in pregnancy but is not required if splinting is effective (oral glucocorticoids are less effective and generally avoided in pregnancy). Surgical intervention can be considered during pregnancy for patients with severe symptoms (eg, motor weakness, thenar atrophy); it is not indicated for patients with mild to moderate symptoms that can be managed with conservative measures and will likely resolve after delivery.

**(Choice D)** Wrist splinting is safe and effective during pregnancy, and is unlikely to cause fetal harm; treatment need not be delayed until after delivery.

#### Educational objective:

Carpal tunnel syndrome is common in pregnancy. Most patients with mild symptoms respond to nocturnal wrist splinting, which holds the wrist in a neutral position and prevents excessive flexion during sleep. In most cases, symptoms resolve spontaneously after childbirth.

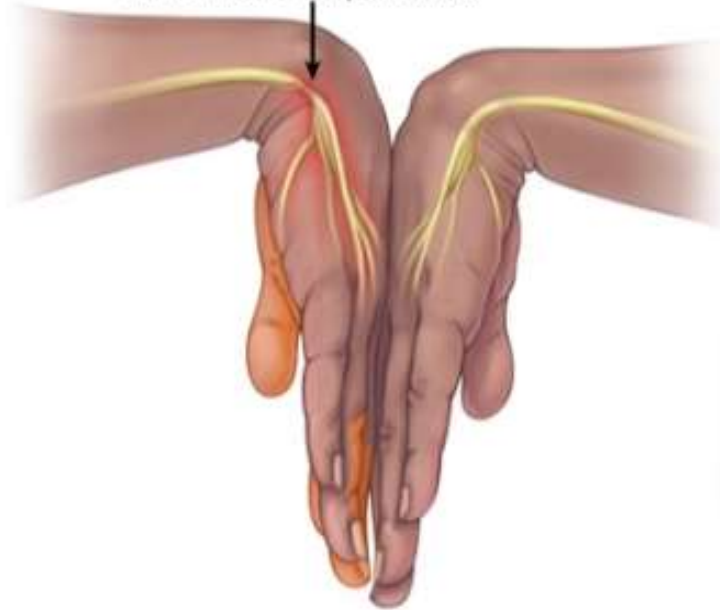
#### References

- [Long-term result and patient reported outcome of wrist splint treatment for carpal tunnel syndrome.](#)
- [Carpal tunnel syndrome in pregnancy: a review.](#)

Exhibit Display

### Provocative tests for carpal tunnel syndrome

Flexion of wrist compresses nerve inside carpal tunnel



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Phalen test

Light tapping elicits tingling sensation



Tinel sign