

# The Surgical Patient

## Drainage with antibiotics is effective therapy for appendicitis in pregnancy

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**M**anaging appendicitis in the pregnant patient is complex, and some of the approaches are controversial. Consideration must be given to the effects of treatment on mother and fetus. The risks and benefits of radiologic imaging, conservative versus surgical management, and use of antibiotics must be weighed carefully. Knowing the gold standards in imaging and approaches to conservative management in the pregnant patient can promote a favorable outcome.

### CASE

A 32-year-old Hispanic woman, G5P3A1 at 32 weeks' gestation, presented to the emergency department with a 16-day history of recurrent diffuse abdominal pain and intermittent nausea, vomiting, and chills. She had previously been evaluated twice at an urgent-care facility, where she was treated with IV resuscitation and a GI cocktail for presumed gastroenteritis. Each time, her symptoms improved and she was sent home. The patient denied vaginal bleeding, uterine cramps or contractions, bloody diarrhea, change in bowel habits, fever, or other constitutional symptoms. The prenatal history was unremarkable. Based on a 25-week ultrasound, the patient was given an estimated delivery date in 8 weeks. She was current on her obstetric appointments and reported no other medical problems or previous surgical intervention. Her only medication was prenatal vitamins.

**Physical examination** The patient appeared to be in mild distress. She was afebrile and normotensive but tachycardic. Her abdomen was exquisitely tender throughout, with positive rebound and guarding. Fundal height was estimated at 33 cm. Gynecologic examination revealed a soft cervix measuring 2 cm; the fetus was in vertex position at -3 station and demonstrated normal activity. Laboratory data indicated only mild acidosis; a WBC count was normal. CT of the abdomen and pelvis with IV and oral contrast identified an intra-abdominal fluid collection measuring 3.0×6.3 cm in the right lower quadrant consistent with perforated appendicitis (Figure 1).

**Fluid collection** The patient was admitted to the labor and delivery unit for fetal monitoring and started on IV antibiotics, tocolytics, and fluid resuscitation. She underwent CT-guided drain placement into the intra-abdominal fluid collection adjacent to the gravid uterus. On hospital day 5, the patient began to complain of vaginal discharge, and examination revealed spontaneous rupture of membranes. She underwent an uneventful spontaneous vaginal birth, delivering a viable male, with a gestational age of 33 weeks and Apgar scores of 5 and 7.

On postpartum day 3, output from the drain was diminished. A repeat CT of the abdomen and pelvis revealed a secondary abscess for which the mother underwent percutaneous placement of a transgluteal drain. The remainder of her hospital course was uneventful, and she was discharged on postpartum day 4 with two drains and oral antibiotics.

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**FIGURE 1.** A rim of accumulated enhancing fluid (arrow) surrounds the intra-abdominal portion of the uterus, consistent with a diagnosis of perforated appendicitis.

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**Follow-up** At the patient's follow-up clinic visit, her symptoms had completely resolved. The antibiotics were discontinued, and the percutaneously placed drains were removed. A repeat CT revealed no further abscess collections. The patient was offered an interval appendectomy, but thus far, she has declined this procedure.

## DISCUSSION

**Incidence** The most frequent nonobstetric reason for emergent surgical intervention during pregnancy is appendicitis. The incidence of this rare presentation is reported to be approximately 1 in 1,500 pregnancies.<sup>1</sup>

In 1992, Mahmoodian reviewed 720 previously reported cases of confirmed appendicitis in pregnant patients. Of those 720 cases, 26% occurred during the first trimester, 48% during the second trimester, and 26% during the third trimester.<sup>2</sup>

Ueberrueck reviewed 94 appendectomies performed in pregnant patients from 1974 through 2000. The overall perforation rate was 14.9%. The risk of perforation increased during the later stages of pregnancy, with 8.7% of all perforations occurring during the first trimester, 12.5% in the second trimester, and 26.1% in the third trimester.<sup>3</sup>

**Manifestations** Patients classically present with anorexia, nausea, vomiting, and periumbilical pain that subsequently migrates to the right lower quadrant. During pregnancy, as the gravid uterus enlarges in size, the appendix may be displaced upward toward the costal margin. These patients may present with atypical right-sided abdominal, flank, or back pain.<sup>1</sup>

Patients with perforated appendicitis may present with diffuse peritonitis or, as our patient did, with fevers, chills, and tachycardia if the perforation walls off, forming an abscess.

**Differential diagnosis** The differential diagnosis of abdominal pain during pregnancy can be either obstetric/gynecologic or nonobstetric. Nonobstetric causes of abdominal pain include gastroenteritis, urinary tract infections, cholecystitis, pancreatitis, incarcerated or strangulated hernia, bowel obstruction, pulmonary embolism, pneumonia, sickle cell disease, Meckel's diverticulum, and mesenteric adenitis, among others.

Gynecologic and obstetric causes of abdominal pain in the pregnant patient include false labor or Braxton Hicks contractions, ovarian cysts, adnexal torsion, placental abruption, chorioamnionitis, preeclampsia, preterm labor, and salpingitis.

**Imaging** Graded compression ultrasonography is a non-invasive procedure that should be considered first in the workup of acute appendicitis. Helical CT has been successful in identifying appendiceal changes and may help distinguish simple appendicitis from complicated appendicitis. Helical CT may also identify the location of the appendix in the pregnant patient and help rule out other causes of abdominal pain. A safe level of radiation exposure in pregnancy is 5 rad, which makes CT using 300 mrad an acceptable alternative.<sup>4</sup>

**Management** Early surgical intervention for simple appendicitis is the treatment of choice. The goal of therapy is to prevent appendiceal perforation, which carries a significant risk of morbidity and mortality for both the mother and the child. The appendix may be removed safely using laparoscopic techniques through the first trimester, when the gravid uterus is midway between the umbilicus and the pubic symphysis. After the 20th week of gestation, the gravid uterus rises above the umbilicus, making laparo-

“Management of appendicitis in pregnant patients includes IV hydration, antibiotics, and close monitoring of the fetus.”

scopic removal hazardous, and an open surgical approach is indicated. A broad-spectrum antibiotic with anaerobic coverage, such as one of the second-generation cephalosporins, is appropriate if perforation has occurred.

When the patient presents with a well-defined, walled-off abscess, as our patient did, percutaneous drainage should be attempted if it can be performed safely. Weighing the risks versus benefits of drainage can help assess whether drainage will be successful in the overall treatment and may determine if other treatment alternatives should be implemented. Once the abscess is localized via CT scan, a percutaneous drain is put in place by an interventional radiologist using aseptic technique with local anesthesia. For optimum access to the appendiceal abscess, a pigtail catheter is placed, utilizing the shortest pathway while avoiding any adjacent structures, including the bowel and vital organs. The quantity of purulent drainage is recorded daily by either the nurse or the patient to determine when the drain can be removed safely. A daily recording or single measurement of less than 20 mL of serosanguineous drainage without purulence usually indicates that the drain can be removed. Pregnant patients whose appendiceal abscess is successfully treated nonoperatively with antibiotics and drainage may be offered an interval appendectomy in 6 weeks or after delivery.

A recent study by Kaminski suggests only a 5% incidence of recurrent appendicitis in patients initially treated nonoperatively. Furthermore, patients who had a recurrent episode of appendicitis requiring appendectomy had a hospital stay of only 4 days, compared with the 6-day stay observed in patients who underwent an elective interval appendectomy.<sup>5</sup>

Patients presenting with diffuse peritonitis or signs and symptoms of shock should receive aggressive resuscitation, start broad-spectrum antibiotics, and undergo immediate

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exploration. Fetal distress or signs and symptoms of preterm labor are also indications for immediate surgical intervention.

## CONCLUSION

Appendicitis is the most frequent nonobstetric indication for emergent surgical intervention during pregnancy. Patients may present with classic signs and symptoms, including periumbilical abdominal pain that migrates to the right lower quadrant (McBurney point), fever, nausea, anorexia, and leukocytosis, but these clinical findings may be erroneously attributed to the pregnancy itself.

As the pregnancy progresses, the appendix may become displaced cephalad by the growing uterus. This may result in an atypical clinical presentation of acute appendicitis, further complicating and delaying the diagnosis. An extensive differential diagnosis should be entertained, followed by appropriate workup and diagnostic imaging.

Management of appendicitis in pregnant patients includes IV hydration, antibiotics, and close fetal monitoring. When appendicitis is diagnosed early, an appendectomy should be performed. If the appendix has ruptured and formed a well-defined abscess and the patient and fetus are stable, the abscess can be percutaneously drained and antibiotics given.

An interval appendectomy may be performed after the baby is born, or the patient can safely be watched and counseled that she has a 5% chance of having another episode of appendicitis in the future. Patients who present with diffuse peritonitis or evidence of fetal distress or preterm labor warrant immediate abdominal exploration and appendectomy. [JAAPA](#)

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## REFERENCES

1. Mourad J, Elliott JP, Erickson L, Lisboa L. Appendicitis in pregnancy: new information that contradicts long-held clinical beliefs. *Am J Obstet Gynecol*. 2000;182(5):1027-1029.
  2. Mahmoodian S. Appendicitis complicating pregnancy. *South Med J*. 1992;85(1):19-24.
  3. Ueberrueck T, Koch A, Meyer L, et al. Ninety-four appendectomies for suspected acute appendicitis during pregnancy. *World J Surg*. 2004;28(5):508-511.
  4. Old JL, Dusing RW, Yap W, Dirks J. Imaging for suspected appendicitis. *Am Fam Physician*. 2005;71(1):71-78.
  5. Kaminski A, Liu IL, Applebaum H, et al. Routine interval appendectomy is not justified after initial nonoperative treatment of acute appendicitis. *Arch Surg*. 2005;140(9):897-901.
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