

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 63 year old woman presents with abdominal pain of approximately 12 hours duration. The pain was originally generalized throughout the abdomen but now is located in the right lower quadrant. The patient has had three episodes of dry heaves without vomiting. The pain is worse with motion. She has had no diarrhea or blood in the stool. On physical examination, her abdomen is soft but she has right lower quadrant tenderness with rebound tenderness. Her temperature is 98.4. Her white count is 16,700 with 85% neutrophils. Her urinalysis shows 2+ RBCs with 10-15 cells per high powered field.

Which imaging study is most appropriate for this patient?

- (a) plain films of the abdomen
- (b) ultrasound of the right abdomen
- (c) computed tomography of the abdomen and pelvis
- (d) magnetic resonance imaging of the abdomen and pelvis

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
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Answer: (c), computed tomography of the abdomen and pelvis, is the correct answer. CT examination is the study of choice for “abdomen pain plus” where the “plus” represents inflammation (fever, elevated white count, rebound tenderness, peritoneal signs), suspected obstruction (distension with nausea/vomiting), or weight loss.

Plain films of the abdomen are generally of little utility in the evaluation of abdominal pain, with the possible exception of suspected obstruction. Even then, a CT is often done after the plain film has been obtained. This is because in patients with suspected obstruction fluid-filled loops will not show up on the plain film (resulting in a false-negative study). In addition, if findings of obstruction are seen on the plain films, a CT is often requested to evaluate the location and cause of obstruction. Therefore, (a) is incorrect. Ultrasound of the abdomen is the study of choice for suspected biliary colic/right upper quadrant pain, but ultrasound of the abdomen is not nearly as effective in diagnosing causes of abdominal pain originating in the other quadrants, and (b) is incorrect. Magnetic resonance imaging of the abdomen is usually reserved for evaluation of problem patients when ultrasound or CT is nondiagnostic, and (d) is incorrect.

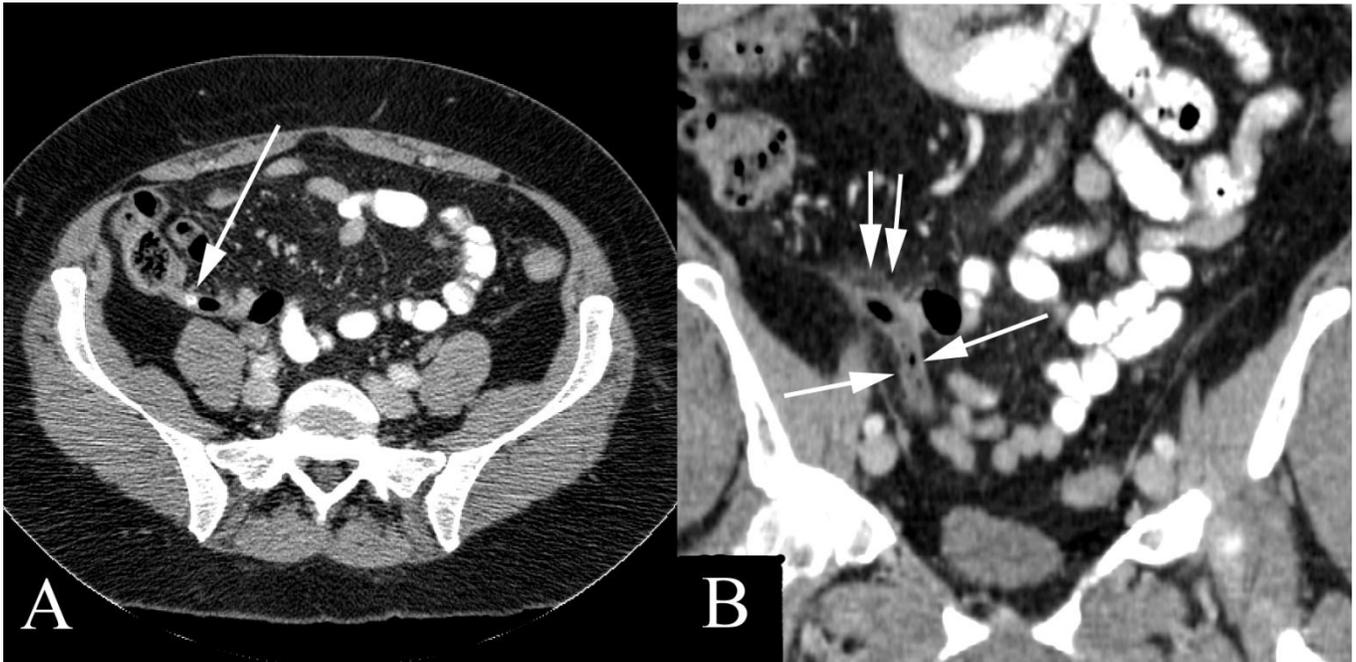
IMAGING STUDY AND QUESTIONS



Imaging questions:

- 1) What type of study is shown in the figure?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

## IMAGING STUDY QUESTIONS AND ANSWERS



- 1) What type of study is shown in the figure? Computed tomography (CT) of the abdomen and pelvis, performed with oral and IV contrast material.
- 2) Are there any abnormalities? In A, an axial image, there is an appendicolith at the base of the appendix (arrow). The cecum is to the patient's right (our left) of the appendicolith and the appendix trails off toward the midline. In B, a coronal image, double arrows mark some peri-appendiceal fat stranding, whereas the appendix itself is between the two single arrows. The anatomy and abnormalities are much easier to see when using a workstation allowing rapid scrolling through a stack of images and/or off-axis reconstructions.
- 3) What is the most likely diagnosis? Appendicitis.
- 4) What is the next step in management? Surgical consultation with expected appendectomy.

<b>PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP</b>
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The patient was referred to a surgeon who concluded that the patient's symptoms were in all likelihood coming from acute appendicitis. The patient was taken to the operating room where she underwent open appendectomy. The diagnosis by the pathologist was "acute appendicitis with periappendicitis." The patient had a rapid, excellent recovery and had no further right lower quadrant pain.

## SUMMARY

**Presenting symptom:** Right lower quadrant pain has multiple causes including appendicitis, diverticulitis, Meckel diverticulum, and pyelonephritis. In many cases, such as this one, the patient's history is classic for acute appendicitis. However, given the patient's age, the possibility of diverticulitis of the right lower quadrant also had to be considered, which would have resulted in much different treatment. Therefore a CT was performed.

**Imaging work-up:** As noted on page 2, CT examination is the study of choice for "abdomen pain plus" where the "plus" represents inflammation (fever, elevated white count, rebound tenderness, peritoneal signs), suspected obstruction (distension with nausea/vomiting), and weight loss. A possible exception is if the pain is in the right upper quadrant, in which case biliary colic should be suspected, and right upper quadrant ultrasound should be performed (see Radiology Quiz of the Week #23). Whether the CT is to be performed with or without oral contrast, and with or without (or both) intravenous contrast, will vary widely from institution to institution, and is discussed in detail in the third reference listed below. Note also that in some institutions, particularly in pediatric patients, ultrasound is sometimes used as the primary imaging modality for evaluation of right lower quadrant pain. This may be a reasonable choice for an initial study in a pediatric patient, particularly if the institution has extensive experience and expertise in ultrasound evaluation of appendicitis, but in this patient, diverticulitis needed to be excluded, which would be difficult to do with ultrasound.

**Establishing the diagnosis:** Appendicitis is a pathologic diagnosis rendered on the basis of the operative specimen.

**Take-home message:** CT examination is the study of choice for imaging "abdomen pain plus."

### FURTHER READING

Goldberg JE, Hodin RA. Appendicitis in adults. UpToDate, accessed 7/7/09.

Penner RM, Majumdar SR. Diagnostic approach to abdominal pain in adults. UpToDate, accessed 7/6/09.

Renfrew, DL. "First step" imaging of gastrointestinal symptoms. Chapter 7 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).