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Patient Care

Office Urgencies

Acute abdominal pain: What not to miss

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How can you be sure not to miss the clues for abdominal catastrophes such as ectopic pregnancy, MI, abdominal aortic aneurysm, and ischemic bowel? For appendicitis, should you order an ultrasound or a CT scan?

Diagnosing acute abdominal pain is fraught with difficulty. Patients rarely present with classic histories and physicals. Childbearing women, the elderly, and children have a complex differential diagnosis. There are several abdominal disorders where a missed diagnosis can have deadly consequences. To overcome these diagnostic challenges, clinicians need to perform a careful history, a thorough evaluation of symptoms, a comprehensive physical examination, and use laboratory and radiologic tests judiciously.

DIAGNOSTIC CHALLENGES

One of the difficulties in diagnosing acute abdominal pain is that many disorders can present in uncommon ways. Unfortunately, only 50% to 60% of patients have a classic presentation of appendicitis—poorly localized periumbilical pain followed by nausea and vomiting with subsequent migration of pain to the right lower quadrant. Other patients may present with pain in the right upper quadrant. Unusual presentations of appendicitis tend to occur when the appendix is in a retrocecal location, when the patient is at an extreme of age, or when the patient is pregnant.[1] Although less common, syncope, flank pain, or testicular pain can also occur with abdominal aortic aneurysm (AAA). In an ectopic pregnancy, do not dismiss the symptoms of syncope, diffuse or nonlocalized pain (if ruptured), or vaginal bleeding. Lastly, do not overlook causes of abdominal pain that originate outside the abdomen such as pneumonia and diabetic ketoacidosis.

Is it a surgical disorder?

Acute, severe, worsening, or persistent abdominal pain suggests a surgical disorder. Some of the potential causes of severe, sudden-onset abdominal pain include perforated ulcer or abdominal viscus, ruptured AAA, ovarian or testicular torsion, ruptured ectopic pregnancy, and ruptured ovarian cyst. The location of the pain is important in forming a differential diagnosis. Right upper quadrant pain suggests gallbladder disease or hepatitis, while right lower quadrant pain suggests acute appendicitis or, in women, ovarian or tubal problems. The severity of the pain may not have any relationship to the seriousness of the condition. Renal colic can cause incapacitating pain, yet for most patients the condition is not serious, and they spontaneously pass their stone.

A very long duration of abdominal pain often, but not always, suggests a less acute cause of the pain, and should raise suspicion for cancer, other abdominal masses, or AAA. Fever may indicate associated infection or inflammation and severe related processes (ascending cholangitis, for example) or abscesses. Tachycardia may signify simply a physiologic response to pain, or it may indicate associated infection or sepsis or other severe systemic illness secondary to internal bleeding or fluid shifts. Intraperitoneal blood can also cause a relative bradycardia. Leukocytosis often signifies a significant condition, particularly when it is associated with an increased neutrophil count ("left shift" of the differential), but occasionally an elevated count is simply a response to stress or pain secondary to demargination of the WBCs within the vasculature.

Abdominal catastrophes

Many serious causes of abdominal pain may be overlooked if the clinician does not make a special effort to consider them initially in the differential diagnosis. The following 4 abdominal catastrophes can be deadly if missed:

MI Besides epigastric pain, clinicians need to be vigilant for several symptoms in acute MI. Nausea and vomiting are common, particularly with inferior wall MI. Also, diaphoresis is frequently present with acute MI and almost always signifies a severe process. Dizziness or syncope may also be presenting symptoms.

AAA Missed diagnosis of AAA can occur in 30% to 60% of cases, mainly because the physical examination is frequently unreliable.[2] Neither the presence of bruits nor absence of pulses predicts AAA. Often patients with ruptured AAA are misdiagnosed with nephrolithiasis because they may have hematuria, have no palpable pulsatile mass, and have flank pain. Other common misdiagnoses of ruptured AAA include diverticulitis, GI hemorrhage, acute MI, and musculoskeletal back pain. A history of cardiovascular problems or hypertension in conjunction with abdominal, flank, or testicular pain in a middle-aged or elderly patient should always raise the possibility of AAA.

Ischemic bowel This disorder is difficult to diagnose as it may mimic many intestinal diseases and be clinically confused with certain nonischemic conditions. The many

causes of critically reduced blood flow to the bowel range from occlusions of mesenteric arteries or veins to bowel obstruction and overdistention. Serum lactic acid levels can aid in the diagnosis (elevated levels signify bowel ischemia or infarction) but the findings cannot be relied upon to exclude the diagnosis. Note that patients with atrial fibrillation or a history of congestive heart failure (CHF) are at increased risk for ischemic bowel syndromes.

Ectopic pregnancy The possibility of ectopic pregnancy must always be considered in women of childbearing age and this diagnosis must be ruled out. You cannot rely on the history and physical examination to determine pregnancy; however, a ß-human chorionic gonadotropin assay result is highly reliable.

LABORATORY TESTS AND DIAGNOSTIC IMAGING

The 2000 American College of Emergency Physicians (ACEP) guidelines include

• In elderly patients and those with cardiac risk factors with upper abdominal pain of unclear origin, obtain an ECG to rule out an MI.

• In all women of childbearing age who present with abdominal pain, obtain a pregnancy test.

• In patients in stable condition over the age of 50 years with unexplained abdominal pain, obtain an abdominal ultrasound (US) or a CT scan, which may help in evaluating for AAA.

• In women with diagnoses of pelvic inflammatory disease (PID) or urinary tract infections (UTIs), consider the diagnosis of appendicitis.[3]

Laboratory tests

The most frequently ordered study for abdominal pain is the CBC. An elevated WBC count in the context of abdominal pain implies a serious pathology. The CBC should never be used to make the sole diagnosis, however, because nearly 11% of normal adults have an elevated WBC count and 13% have left shifts.[4] Conditions ranging from gastroenteritis to appendicitis to lower lobe pneumonia and diabetic ketoacidosis can cause the WBC count to be elevated. Even more important, a normal WBC count does not exclude a more serious or surgical cause of abdominal pain. An additional laboratory examination measures the C-reactive protein value, but there is controversy about the relevance of the CRP marker to the diagnosis of acute appendicitis.

Imaging studies

Imaging technology such as US and helical CT play a critical role in helping clinicians in their diagnoses. Deciding which imaging test should be ordered to detect a particular disease entity can be complicated (see Table 1).

TABLE 1
Diagnostic studies for common abdominal presentations

	CBC	Electrolytes	Urinalysis	Radiography	Ultrasound	CT	Other
Abdominal aortic aneurysm	A		A		Y	Y	Angiography, MRI
Appendicitis	Y		A		Y	Y	CRP
Biliary tract disease	A		A		Y*	Y	HIDA scan
Bowel obstruction, perforation	A		A	Y*	N	Y	
Cholecystitis	A		A		Y*	Y	
Diverticulitis	A		A		N	Y	Barium enema contraindicated
Ectopic pregnancy	A		A		Y*		hCG, progesterone
Gastroenteritis	Y	Y	A				Fecal leukocytes
Hernia			A			Y (except hiatal hernia)	Physical examination
Intestinal	A		A	A		Y	Angiograph

infarction/ischemia							y, ECG, MRI
Ovarian torsion	Y		A		Y		Doppler imaging
Pancreatitis	A		A		Y	Y	Lipase,* amylase
Pelvic inflammatory disease	Y		A		A	A	ESR, CRP
Pyelonephritis	Y		Y		A	Y	
Renal colic	A	Y	Y		A	Y	Helical CT, IVP
Testicular torsion			Y		Y		Doppler imaging, nuclear scan
Urinary tract infection	Y		Y*			A	

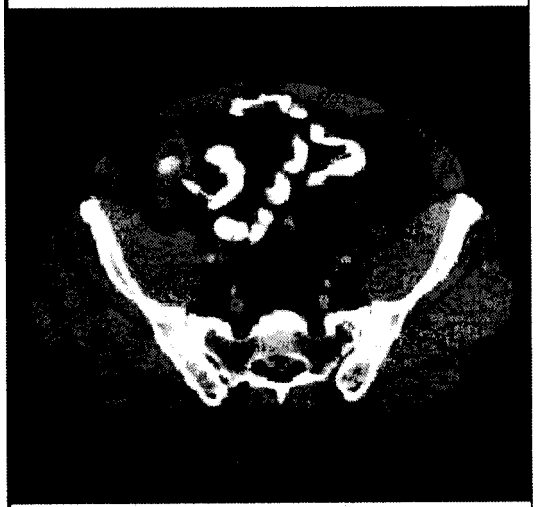
Key: A, helpful adjunct to testing for disease but not necessarily indicated; CRP, C-reactive protein; hCG, beta human chorionic gonadotropin; HIDA, hepatic iminodiacetic acid; IVP, intravenous pyelogram; N, not helpful; Y, indicated for establishing diagnosis.

*Diagnostic test of choice to detect the particular disease entity.

Adapted from Graff LG, Robinson D. Abdominal pain and emergency department evaluation. *Emerg Med Clin North Am.* 2001;19:123-136. Copyright 2001, with permission from Elsevier.

CT versus US In general, right upper quadrant pain is best evaluated initially by US. For other etiologies, CT of the abdomen is recommended in nonpregnant patients. In pregnant patients, US would be preferred to minimize radiation. In general, CT scanning of the entire abdomen and pelvis is performed with IV and oral contrast. This contrast-enhanced CT helps in the staging of many inflammatory, ischemic, and neoplastic processes that may cause acute abdominal pain and may simulate appendicitis (see Figure 1).

FIGURE 1

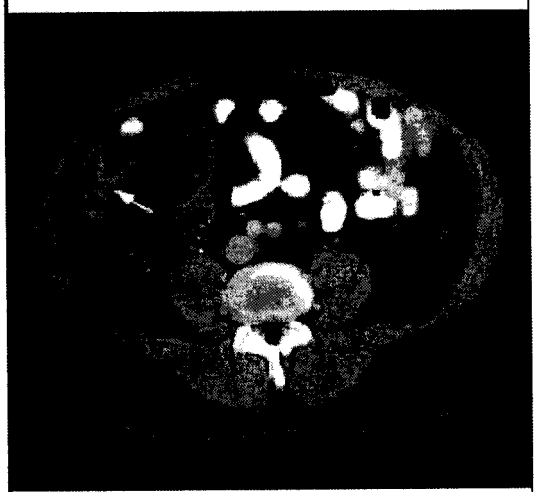


Classic findings of acute appendicitis in a 42-year-old woman who presented with right lower quadrant pain appear in this CT scan. Obtained with oral and IV contrast material, this scan demonstrates an enlarged appendix with a thickened wall containing fluid and an appendicolith (arrow).

CT scanning has been shown to improve clinician's decision-making ability in patients with moderate probability of appendicitis. A study examined the usefulness of CT in these patients and found that 53 of 100 patients had appendicitis, while the emergency department (ED) found only 3 of 100 patients to have appendicitis. CT imaging resulted in decreased false-negative clinical evaluations—18 of the patients with appendicitis were observed and then taken to surgery who otherwise would have been released after their evaluation. The imaging also resulted in decreased false-positive clinical evaluations—13 nonappendicitis patients were not taken to surgery who otherwise would have been after the surgeon's initial evaluation.[5]

CT, with its high accuracy for confirmation or exclusion of various other differential diagnoses of acute abdominal conditions, has become the key imaging modality for the diagnosis of acute bowel ischemia (see Figure 2).[6] Accurate CT scanning of acute bowel ischemia usually requires IV administration of iodinated contrast material. The most common CT finding in acute bowel ischemia is bowel wall thickening. In contrast to angiographies, the CT scan is able to demonstrate not only vascular occlusions but also bowel wall changes.

FIGURE 2



This CT scan, obtained with oral and IV contrast material in a 59-year-old man with abdominal pain, demonstrates thickened small bowel loops in the right lower quadrant (arrow) consistent with bowel ischemia. This was due to a thrombus in the superior mesenteric vein (not depicted on this image).

Although a CT scan of the abdomen is typically considered to have the best sensitivity and specificity for appendicitis in children and pregnant patients, exposure to ionizing radiation from CT scans must be considered. Because of this consideration, US is frequently used in these patients to diagnose appendicitis, although its accuracy is highly operator-dependent.

Abdominal US is useful for diagnosing gallbladder disease and associated hepatobiliary findings and for evaluating pregnancy and gynecologic structures (see Figure 3). Also, US is used increasingly in the ED for rapid evaluation for hemoperitoneum or AAA.

FIGURE 3

This abdominal ultrasound of a 52-year-old woman presenting with right upper quadrant pain demonstrates multiple gallstones (arrow) and an edematous gallbladder wall (arrowhead) consistent with cholecystitis, which was confirmed on surgery.

Other radiologic tests The opinion in emergency medicine is that a combination of chest and abdominal radiographs should be obtained primarily when evaluating for free air (indicative of perforated ulcer/perforated viscus) or for bowel obstruction. The sensitivity of plain film radiographs for other findings is limited.

PATIENTS REQUIRING SPECIAL CONSIDERATIONS

Certain patient populations require special vigilance for diagnosing the cause of acute abdominal pain. The elderly do not mount a vigorous inflammation response and have concurrent medical problems. Pregnant women with appendicitis may present with pain in the right upper quadrant when the uterus displaces other abdominal organs in the second and third trimesters. Last, younger children may have difficulty localizing their pain.

Childbearing women

Women with abdominal pain have a more complex differential diagnosis than men. They may develop problems related to an ovary or a fallopian tube, for example. Up to one third of women of childbearing age with appendicitis are initially misdiagnosed with PID or UTI.

Pregnant women with abdominal pain present several difficulties. In addition to all of the usual causes of abdominal pain, they may have atypical locations for abdominal

conditions such as pain in the right upper quadrant for appendicitis. In later pregnancy, the possibility of abruptio placentae must be considered as well. Pain may also be simply due to the pregnancy, but this is usually a diagnosis of exclusion. There are also concerns about obtaining imaging tests utilizing ionizing radiation (radiographs or CT scans), although the general principle is that if the clinical condition truly warrants a specific imaging test, the risks and benefits of this procedure must be discussed with the patient and/or their family.

Elderly patients

A low threshold should be used for admitting elderly patients for observation because they often have atypical presentations for abdominal conditions. Concurrent medical problems such as cardiovascular disease, hypertension, or diabetes might place them at risk for many significant abdominal conditions. Also, older patients may have had previous abdominal surgeries, placing them at risk for complications from these procedures. Finally, because of the difficulties in either diagnosing or ruling out ischemic bowel, those in the high-risk elderly age-group should invoke a very low threshold for surgical consultation, observation and reexamination, or hospital admission.

Fever cannot help to distinguish surgical from nonsurgical disorder in the elderly. Despite higher rates of perforation and sepsis, the majority of elderly patients with acute cholecystitis and appendicitis are afebrile. Auscultation of bowel sounds can aid in the evaluation of abdominal pain. For example, elderly patients with abdominal pain and abnormal bowel sounds frequently have serious disease.[7]

Children

In children, pain that is exacerbated by movement or coughing (focal peritoneal inflammation) or intermittent, recurrent episodes of severe pain (suggestive of intussusception) may indicate specific etiologies. Classically, pain preceding vomiting suggested a more serious, or potentially surgical cause of the abdominal pain. Vomiting followed by pain can indicate gastroenteritis or a less serious cause of pain. While this premise may have some validity, it obviously cannot be relied upon, and other clinical findings must guide evaluation and treatment.

For children with an apparent surgical cause of abdominal pain, such as appendicitis, one of the challenges is whether to obtain imaging such as CT or US to confirm the diagnosis, or to proceed directly to surgical consultation. Some clinicians believe it is best to err on the side of caution and to obtain early surgical consultation. A recent study examined the efficacy of different radiologic modalities for the diagnosis of appendicitis. Any child suspected of having appendicitis but who had an equivocal examination had an US. In addition, a CT scan was completed for any US-negative or US-indeterminate patient. In the pre-protocol era, 57% of all 920 children had appendicitis, and 35% of them had perforation. After the protocol was implemented, 78% of all 418 patients had appendicitis, and 15% of them had perforation. Rates of negative appendectomy in

clinically equivocal patients declined from 14% preprotocol to 4% postprotocol implementation. In children younger than 5 years, the results were not significant, but for patients older than 6 years, the differences were statistically significant. As such, a combination of CT and US was recommended to evaluate children with suspected appendicitis.[8]

SURGICAL CONSULTATION VERSUS OBSERVATION

Surgical consultation is recommended for any patient with peritoneal symptoms and findings suggesting appendicitis or other focal inflammatory conditions. Patients with appendiceal or diverticular abscesses, evidence of ascending cholangitis, perforated viscus, or intestinal ischemia all require surgical consultation. Other surgical subspecialists should be consulted for known or suspected testicular torsion (urology), known or suspected ectopic pregnancy or ovarian torsion (obstetrics/ gynecology), or AAA (vascular surgery).

Patients with acute, severe, worsening, or persistent abdominal pain in whom no obvious diagnosis is found, despite adequate clinical and diagnostic testing, probably warrant observation and potentially, hospital admission. Observation may also be an option when no obvious indication for immediate surgery is present but diagnostic testing will be delayed for any reason.

PRODUCED BY ANNE B. BROWN

Dr Bohrn and Dr Siewert disclose that they have no financial involvement with any companies doing business in this field.

REFERENCES

1. Birnbaum BA, Wilson SR. Appendicitis at the millennium. *Radiology.* 2000;215:337-348.

2. Lederle FA, Simel DL. Does this patient have abdominal aortic aneurysm? *JAMA.* 1999;281:77-82.

3. American College of Emergency Physicians. Clinical policy: critical issues for the initial evaluation and management of patients presenting with a chief complaint of nontraumatic acute abdominal pain. *Ann Emerg Med.* 2000;36:406-415.

4. Graff LG, Robinson D. Abdominal pain and emergency department evaluation. *Emerg Med Clin North Am.* 2001;19:123-136.

5. Rao PM, Rhea JT, Novelline RA, et al. Effect of computed tomography of the appendix on treatment of patients and use of hospital resources. *N Engl J Med.* 1998;338:141-146.

6. Weisner W, Khurana B, Ji H, et al. CT of acute bowel ischemia. *Radiology.* 2003;226:635-650.

7. Marco CA, Schoenfeld CN, Keyl PM. Abdominal pain in geriatric emergency patients: variables associated with adverse outcomes. *Acad Emerg Med.* 1998;5:1163-1168.

8. Kaiser S, Frenckner B, Jorulf HK. Suspected appendicitis in children: US and CT—a prospective randomized study. *Radiology.* 2002;223:633-638.

Acute abdominal pain: What not to miss. *Patient Care* March 2004;38:31-39.