MRI of the Nontraumatic Acute Abdomen

Description of Findings and Multimodality Correlation

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KEYWORDS

• Abdomen • Magnetic resonance • Computed tomography • Appendicitis • Abdominal pain

KEY POINTS

- Imaging plays a critical role in evaluation of the acute abdomen; the signs and symptoms of disease processes causing acute abdomen have a high degree of overlap.
- Although computed tomography and ultrasound are first-line imaging tests for the acute abdomen, MRI offers comparable diagnostic performance for many disease entities.
- MRI may be considered for evaluation of the nontraumatic acute abdomen when other modalities are equivocal, suboptimal, or contraindicated.
- In some patient populations with certain indications, MRI may be appropriate as the first-line imaging test.

Disclosures: Dr P.J. Pickhardt is co-founder of VirtuoCTC; advisor to Check-Cap and Bracco; and shareholder in SHINE, Elucent Medical, and Cellectar Biosciences. Dr S.B. Reeder is co-founder of Calimetrix and shareholder in Elucent Medical and Cellectar Biosciences. The other authors have no disclosures.

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Gastroenterol Clin N Am ■ (2018) ■–■

https://doi.org/10.1016/j.gtc.2018.04.010

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Abbreviations

Ax	Axial
Cor	Coronal[b]
CT	Computed tomography
(FS)	Fat suppressed
+C	IV contrast enhanced[c]
T1	T1-weighted image
T2	T2-weighted image[a]

[a] T2-weighted images are acquired using single-shot fast spin echo technique.
[b] Coronal MRI are primarily acquired in the coronal plane. Coronal computed tomography images are reconstructed from axial source images.
[c] Intravenous contrast material is iodine based for computed tomography scans and gadolinium based for MRI.

INTRODUCTION

The diagnosis of a specific etiology of nontraumatic acute abdominal pain presents a continual clinical challenge. This is particularly true for the so-called acute abdomen, referring to a severe, progressively worsening abdominal pain that often represents a true medical emergency. The abdomen and pelvis contain multiple organ systems, any of which can be home to a disease process presenting as acute abdominal pain. Chief among these is the gastrointestinal system, but the vascular system, genitourinary system, and—especially in women—the reproductive system are frequent sources of an acute abdomen presentation.[1,2]

Numerous factors contribute to the challenge of clinical diagnosis of the acute abdomen. Symptoms, including pain location, pain quality, guarding, rebound tenderness, abdominal fullness, nausea, vomiting, and diarrhea, often overlap considerably among specific disease entities, and often no specific cause for pain is ever found.[3] For example, the exact location of pain in acute appendicitis can vary based on the variable location of the appendix within the abdomen.[4] Acute diverticulitis, which is often thought of as a disease principally of the sigmoid colon (left lower quadrant pain), can occur anywhere along the large bowel.[5] Laboratory studies, including white blood cell count and other inflammatory markers such as C-reactive protein, are elevated in many different processes.[6] Furthermore, patients may have other comorbidities or may have difficulty relaying history, which complicates the overall clinical picture.

Fortunately, over the last 25 years, the role of imaging in cases of acute abdominal pain has expanded greatly; imaging tests are now routine standard of care for many suspected abdominal diagnoses.[3] This has led to far more accurate and timely diagnoses of acute abdomen presentations. For most suspected abdominal diagnoses, computed tomography (CT) of the abdomen and pelvis with or without intravenous contrast (depending on the leading differential diagnosis consideration) is widely considered to be the first-line imaging study.[7–10] Ultrasound examination is preferred for select indications, most notably evaluation of the gallbladder,[11] female pelvis,[12] and appendicitis in young children.[10]

However, there are a number of cases where CT or ultrasound examination may be contraindicated or suboptimal. Radiation exposure, although generally not problematic at the typical doses used for diagnostic CT, is always a consideration and is more of a concern in younger patients and pregnant women. In patients with an allergy to iodinated contrast agents or with poor renal function, CT may be of limited usefulness. For ultrasound imaging, anatomic considerations—including body habitus—and technical factors may limit the examination. In these patients, MRI is emerging as a