American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Left Lower Quadrant Pain**

Variant 1: **Older patient with typical clinical presentation for diverticulitis.**

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8	Oral and/or colonic contrast may be helpful for bowel luminal visualization.	High
CT abdomen and pelvis without contrast	6		High
X-ray contrast enema	5		Med
US abdomen transabdominal graded compression	4		None
US abdomen transrectal or transvaginal	4		None
X-ray abdomen and pelvis	4		Med
MRI abdomen and pelvis with or without contrast	4	See comments regarding contrast in text under "Anticipated Exceptions."	None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 2: **Acute, severe, with or without fever.**

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	9	Oral and/or colonic contrast may be helpful for bowel luminal visualization.	High
CT abdomen and pelvis without contrast	6		High
X-ray abdomen and pelvis	5		Med
US abdomen transabdominal graded compression	4		None
X-ray contrast enema	4		Med
US abdomen transrectal or transvaginal	4		None
MRI abdomen and pelvis with or without contrast	3		None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Left Lower Quadrant Pain**

Variant 3: **Chronic, intermittent, or low grade.**

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8	Oral and/or colonic contrast may be helpful for bowel luminal visualization.	High
X-ray contrast enema	6		Med
X-ray abdomen and pelvis	5		Med
US abdomen transabdominal graded compression	5		None
CT abdomen and pelvis without contrast	5		High
US abdomen transrectal or transvaginal	4		None
MRI abdomen and pelvis with or without contrast	4	See comments regarding contrast in text under "Anticipated Exceptions."	None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 4: **Woman of childbearing age.**

Radiologic Procedure	Rating	Comments	RRL*
US abdomen transabdominal graded compression	8	Could be done first to exclude gynecologic abnormality.	None
US abdomen transrectal or transvaginal	8	Could be done first to exclude gynecologic abnormality.	None
CT abdomen and pelvis with contrast	7	Oral and/or colonic contrast may be helpful for bowel luminal visualization.	High
X-ray contrast enema	6		Med
CT abdomen and pelvis without contrast	5		High
X-ray abdomen and pelvis	5		Med
MRI abdomen and pelvis with or without contrast	5	See comments regarding contrast in text under "Anticipated Exceptions."	None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 5: **Obese patient.**

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8	Oral and/or colonic contrast may be helpful for bowel luminal visualization.	High
X-ray contrast enema	5		Med
CT abdomen and pelvis without contrast	5		High
X-ray abdomen and pelvis	5		Med
US abdomen transabdominal graded compression	4		None
US abdomen transrectal or transvaginal	4		None
MRI abdomen and pelvis with or without contrast	4	See comments regarding contrast in text under "Anticipated Exceptions."	None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Expert Panel on Gastrointestinal Imaging: Frank H. Miller, MD[1]; Robert L. Bree, MD, MHSA[2]; Max Paul Rosen, MD, MPH[3]; W. Dennis Foley, MD[4]; Spencer B. Gay, MD[5]; Thomas H. Grant DO[6]; Jay P. Heiken, MD[7]; James E. Huprich, MD[8]; Tasneem Lalani, MD[9]; Gary S. Sudakoff, MD[10]; Frederick L. Greene, MD[11]; Don C. Rockey, MD.[12]

Summary of Literature Review

The most common cause of left lower quadrant pain in adults is acute sigmoid diverticulitis, which is estimated to occur in 20%-25% of patients with diverticulosis. Appropriate imaging triage for patients with suspected diverticulitis (ie, left lower quadrant pain) should address two major clinical questions: 1) what are the differential diagnostic possibilities in this clinical situation and 2) what information is necessary to make a definitive management decision. Some patients with acute diverticulitis may not require any imaging, notably those with typical symptoms of diverticulitis (eg, left lower quadrant pain and tenderness, fever) or those with a previous history of diverticulitis who present with clinical symptoms of recurrent disease. Many such patients are treated medically without undergoing radiologic examinations, but diverticulitis can be simulated by other acute abdominal disorders. Furthermore, 15%-30% of patients with diverticulitis require surgery because of associated abscesses, fistulas, obstruction, or perforation. As a result, there has been a trend toward greater use of radiologic imaging tests to confirm the diagnosis of diverticulitis, evaluate the extent of disease, and detect complications before treatment.

Abdominal radiography is of limited value in evaluating diverticulitis unless complications such as free perforation (pneumoperitoneum) or obstruction are suspected. Nuclear medicine imaging appears to have little role in the evaluation of left lower quadrant pain. The role of magnetic resonance imaging (MRI) has not been adequately evaluated, but preliminary data suggest that it may have diagnostic potential in patients with suspected diverticulitis [1-4]. The two imaging tests most often used for diagnosing diverticulitis are the contrast enema and computed tomography (CT), but graded compression sonography has also been used.

[1]Principal Author, Northwestern University Feinberg School of Medicine/NMH, Chicago, Ill; [2]Panel Chair, University of Washington, Seattle, Wash; [3]Panel Vice-Chair, University of Pennsylvania, Philadelphia, Pa; [4]Froedtert Hospital East, Milwaukee, Wis; [5]University of Virginia Health Science Center, Charlottesville, Va; [6]Northwestern University Feinberg School of Medicine/NMH, Chicago, Ill; [7]Mallinckrodt Institute of Radiology, Saint Louis, Mo; [8]Mayo Clinic, Rochester, Minn; [9]Inland Imaging Associates, Seattle, Wash; [10]Froedtert Hospital, Milwaukee, Wis; [11]Carolinas Medical Center, Charlotte, NC, American College of Surgeons;[12]University of Texas, Southwest Medical Center, Dallas, Texas, American Gastroenterological Association.

Reprint requests to: Department of Quality & Safety, American College of Radiology, 1891 Preston White Drive, Reston, VA 20191-4397.

Barium Enema

In the past, the contrast enema was the primary imaging test for diverticulitis. Some authors were reluctant to perform contrast enemas during an acute episode of diverticulitis because of concern about colonic perforation. Others recommended the use of water-soluble contrast media to avoid contaminating the peritoneal cavity with barium if perforation has occurred. However, many studies have shown that single-contrast or even double-contrast barium enemas can be safely performed during the acute episode if there are no clinical signs of perforation. The barium enema has a reported sensitivity of 59%-90% in diagnosing sigmoid diverticulitis [5-9]. It can also be used to detect other colonic diseases (eg, ischemic colitis, inflammatory bowel disease) that cause similar symptomology [5]. The examination, however, is limited, as diverticulitis is mainly an extramucosal process and barium enema only shows the secondary effects of inflammation on the colon [10]. Barium enema is more invasive and is not as sensitive for pericolonic inflammation, abscesses, and distant pathology. Although CT has replaced the contrast enema as the initial imaging test for diverticulitis in most patients, the contrast enema may be helpful as a follow-up study for patients in whom the CT findings cannot unequivocally differentiate diverticulitis from colonic carcinoma.

Computed Tomography

CT is now widely advocated as the imaging test of choice for evaluating patients with suspected sigmoid diverticulitis because of its high sensitivity and specificity and its ability to diagnose other causes of left lower quadrant pain that mimic diverticulitis. It is widely available, reproducible, and less invasive than the contrast enema, and it has a reported sensitivity of 79%-99% [6-9,11]. CT also has a major role in determining disease extent; this assessment is rarely possible with contrast enema. By assessing the presence and extent of abscess formation, CT facilitates selection of patients for medical versus surgical therapy [6-9,11-13]. When abscesses are present, it has been shown that CT-guided percutaneous drainage of abscess collections can eliminate multistage operative procedures and, in some cases, can eliminate the need for surgery entirely [12-15]. Finally, CT can demonstrate extracolonic diseases (eg, genitourinary and gynecologic abnormalities) that have a similar clinical presentation.

A variety of contrast media have been used for CT to optimize the sensitivity and specificity of the examination, including oral and intravenous contrast agents and rectally administered contrast or air. Many authors advocate the use of rectal contrast material to

improve colonic distention and increase the accuracy of the examination for detecting diverticulitis [16].

Ultrasound

Although most of the reported experience has been with CT, transabdominal sonography has been advocated as an alternative technique for evaluating patients with suspected diverticulitis [17-19]. Graded compression sonography is reported to have a sensitivity of 77%-98% and a specificity of 80%-99% in diagnosing diverticulitis [17,18,20]. Some investigators advocate the selective use of transrectal sonography to improve detection of diverticulitis if the findings on transabdominal sonography are negative or equivocal [21]. Transvaginal sonography is particularly of value when left lower quadrant pain and fever occur in women of childbearing age. In this setting, gynecologic processes such as ectopic pregnancy and pelvic inflammatory disease are also important diagnostic considerations. Sonography is therefore an excellent choice for the initial imaging of this patient population, because it is more sensitive than CT or contrast enemas in detecting gynecologic abnormalities that cause left lower quadrant pain. However, graded compression sonography is a technique that is highly operator dependent and ultrasound for diverticulitis is not widely used. MRI can also be effective for diagnosing diverticulitis and has the advantage of lack of radiation, but generally CT is used [2,3].

Finally, it should be recognized that a perforated colon cancer can mimic both the clinical and radiographic findings of diverticulitis. CT findings that suggest colon cancer over diverticulitis include the presence of pericolonic lymphadenopathy (1 cm), with or without pericolonic edema. When there are inflammatory changes and no pericolonic lymphadenopathy adjacent to a segment of thickened colon wall, the most likely diagnosis is diverticulitis [22-24]. Patients with equivocal CT findings of diverticulitis should undergo a follow-up examination of the colonic mucosa after the acute symptoms have resolved. Either a colonoscopy or barium enema could be performed to differentiate diverticulitis from a perforated colon cancer in these patients. Quantitative CT perfusion measurements have been shown to differentiate cancer from diverticulitis. Patients with cancer have the highest blood volume, blood flow, and permeability and the shortest transit time [25].

Summary

CT is now widely advocated as the primary imaging test for evaluating acute sigmoid diverticulitis because of its high sensitivity and specificity, its ability to determine the presence and extent of disease that might warrant percutaneous catheter drainage or surgery, and its ability to demonstrate extracolonic disease in these patients.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF), also known as nephrogenic fibrosing dermopathy) was first identified in 1997 and has recently generated substantial concern among radiologists, referring doctors and lay people. Until the last few years, gadolinium-based MR contrast agents were widely believed to be almost universally well tolerated, extremely safe and non-nephrotoxic, even when used in patients with impaired renal function. All available experience suggests that these agents remain generally very safe, but recently some patients with renal failure who have been exposed to gadolinium contrast agents (the percentage is unclear) have developed NSF [26-28], a syndrome that can be fatal. Further studies are necessary to determine what the exact relationships are between gadolinium-containing contrast agents, their specific components and stoichiometry, patient renal function and NSF. Current theory links the development of NSF to the administration of relatively high doses (eg, >0.2mM/kg) and to agents in which the gadolinium is least strongly chelated. The FDA has recently issued a "black box" warning concerning these contrast agents (http://www.fda.gov/cder/drug/InfoSheets/HCP/gcca_200705HCP.pdf).

This warning recommends that, until further information is available, gadolinium contrast agents should not be administered to patients with either acute or significant chronic kidney disease (estimated GFR <30 mL/min/1.73m^2), recent liver or kidney transplant or hepato-renal syndrome, unless a risk-benefit assessment suggests that the benefit of administration in the particular patient clearly outweighs the potential risk(s) [27].

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document.

Relative Radiation Level Designations	
Relative Radiation Level	**Effective Dose Estimate Range**
None	0
Minimal	< 0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv

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