

**American College of Radiology
 ACR Appropriateness Criteria®**

Clinical Condition: **Palpable Abdominal Mass**

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
CT abdomen with or without contrast	8	Most definitive.	☼ ☼ ☼
US abdomen	7	Less costly and no ionizing radiation.	O
MRI abdomen with or without contrast	6	No ionizing radiation. See statement regarding contrast in text under "Anticipated Exceptions."	O
X-ray abdomen	5	A simple and inexpensive way to evaluate bowel for obstruction or constipation as the cause of the mass.	☼ ☼ ☼
X-ray contrast enema	4		☼ ☼ ☼
X-ray upper GI series	4		☼ ☼ ☼
X-ray upper GI series with small bowel follow-through	4		☼ ☼ ☼
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

PALPABLE ABDOMINAL MASS

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Summary of Literature Review

Introduction/Background

Little has been written about the use of imaging in evaluating palpable abdominal masses since the 1980s. Newer reviews and case reports have focused on evaluation of specific masses using computed tomography (CT), ultrasound (US), and magnetic resonance imaging (MRI). Pathology associated with palpable masses is extensive, hence subcategorization is often helpful. Palpable abdominal masses can often be characterized by physical examination as abdominal wall masses such as lipomas, hematomas, lymph nodes, and hernias, or intra-abdominal masses including neoplasms and abdominal aortic aneurysms. Additionally, distension from constipation, bowel obstruction, and/or volvulus can also sometimes present as a palpable mass.

Ultrasound and Computed Tomography

Investigators have found both US and CT to be excellent for affirming or excluding a palpable abdominal mass [1-5], with sensitivity and specificity values >95% [2,5]. As few as 16%-38% of patients referred for suspected abdominal mass had a diagnosis corroborated by imaging in one study [6]. In other studies, 56.7% (30/53) to 68.3%

(69/101) of patients demonstrated an abnormality confirmed by imaging [3,5]. Confirmation of the presence of the mass should be the first step in a palpable mass workup, which can often be accomplished by imaging if the physical examination is equivocal.

Both US and CT can demonstrate the organ from which a mass arises. The accuracy of US in determining the organ of origin has been 88%-91% [1-2], while CT has fared slightly better at 93% [5]. US is limited by bowel gas in cases of dilated bowel or by body habitus. US is also partly operator dependent, however likely to a lesser extent with directly palpable abnormalities. As expected, attempts to predict the pathologic diagnosis of masses based on imaging findings are less successful. In several studies US findings correctly predicted the pathologic diagnosis in 77%-81% of cases [1-2,7-8], while CT findings suggested the diagnosis in 88% of cases [5].

Investigators have stressed the ability of CT and US to image masses no matter what their organ of origin and have touted them as first-line procedures for evaluating palpable masses [3,7]. Given its lack of ionizing radiation and lower cost, US maintains an advantage over CT and may be used as a first-line imaging modality in certain radiation-sensitive populations (eg, pediatric and pregnant patients) or in patients with suspected subcutaneous masses. CT imaging, which is relatively more costly and involves ionizing radiation, may then be reserved for cases requiring further problem solving secondary to indeterminate US findings or for detecting lesions not visible on US due to body habitus and/or overlying bowel gas. One study demonstrated that, compared with strategies not using CT, the use of CT can result in savings in time for diagnosis and overall cost of hospitalization [3]. Accordingly, when US findings are indeterminate, CT imaging should be obtained in a timely manner. Ultrasound still remains more appropriate as first-line imaging in this radiosensitive population because of its high sensitivity (90%-99%), specificity (97%-100%), and lack of ionizing radiation [9].

Radiographs

Radiographs may also be considered as a first step in certain situations. If the patient reports constipation, a radiograph could be used to confirm or exclude that diagnosis or to diagnose bowel obstruction or colonic volvulus, for example, without the need for CT.

Fluoroscopy

Fluoroscopy studies such as contrast enema, upper GI series, and small-bowel follow-through are usually not appropriate for first-line imaging studies for palpable masses in adults. However, they may be used to further characterize associated degree of obstruction or abnormalities in gastrointestinal functional status or transit. In pediatric patients, upper GI studies can be used to confirm hypertrophic pyloric stenosis, which can present clinically as a palpable abdominal mass.

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Magnetic Resonance Imaging

At the time of this writing, no comparative studies evaluating imaging of palpable masses with MRI versus CT or US are available to our knowledge. MRI may be used to evaluate complex lesions not definitely characterized by US or CT. MRI lacks ionizing radiation and demonstrates cross-sectional and multiplanar capability similar to that of US and multidetector CT. MRI also excels in specifically characterizing fat, protein, fluid, blood products, and metal. Hence, MRI may demonstrate distinct advantages in radiation-sensitive patient populations when the US findings are nondiagnostic. Although MRI offers potential advantages, its exact performance in evaluating palpable masses relative to US and CT remains unclear given the absence of data; however, it is likely at least comparable.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (ie, <30 mL/min/1.73m²), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73m². For more information, please see the [ACR Manual on Contrast Media](#) [10].

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. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults (see Table below). 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*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
⊕	<0.1 mSv	<0.03 mSv
⊕ ⊕	0.1-1 mSv	0.03-0.3 mSv
⊕ ⊕ ⊕	1-10 mSv	0.3- 3 mSv
⊕ ⊕ ⊕ ⊕	10-30 mSv	3-10 mSv
⊕ ⊕ ⊕ ⊕ ⊕	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as NS (not specified).

Supporting Document(s)

- [ACR Appropriateness Criteria[®] Overview](#)
- [Procedure Information](#)
- [Evidence Table](#)

References

1. Aspelin P, Hildell J, Karlsson S, Sigurjonson S. Ultrasonic evaluation of palpable abdominal masses. *Acta Chir Scand* 1980; 146(7):501-506.
2. Barker CS, Lindsell DR. Ultrasound of the palpable abdominal mass. *Clin Radiol* 1990; 41(2):98-99.
3. Dixon AK, Fry IK, Kingham JG, McLean AM, White FE. Computed tomography in patients with an abdominal mass: effective and efficient? A controlled trial. *Lancet* 1981; 1(8231):1199-1201.
4. Holm HH, Gammelgaard J, Jensen F, Smith EH, Hillman BJ. Ultrasound in the diagnosis of a palpable abdominal mass. A prospective study of 107 patients. *Gastrointest Radiol* 1982; 7(2):149-151.
5. Williams MP, Scott IH, Dixon AK. Computed tomography in 101 patients with a palpable abdominal mass. *Clin Radiol* 1984; 35(4):293-296.
6. Colquhoun IR, Saywell WR, Dewbury KC. An analysis of referrals for primary diagnostic abdominal ultrasound to a general X-ray department. *Br J Radiol* 1988; 61(724):297-300.
7. Annuar Z, Sakijan AS, Annuar N, Kooi GH. Ultrasound in the diagnosis of palpable abdominal masses in children. *Med J Malaysia* 1990; 45(4):281-287.
8. White M, Stella J. Ovarian torsion: 10-year perspective. *Emerg Med Australas* 2005; 17(3):231-237.
9. Maheshwari P, Abograra A, Shamam O. Sonographic evaluation of gastrointestinal obstruction in infants: a pictorial essay. *J Pediatr Surg* 2009; 44(10):2037-2042.
10. American College of Radiology. *Manual on Contrast Media*. Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/contrast_manual.aspx.

The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.