

ACR Appropriateness Criteria Indeterminate Renal Mass

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Abstract

Renal masses are increasingly detected in asymptomatic individuals as incidental findings. An indeterminate renal mass is one that cannot be diagnosed confidently as benign or malignant at the time it is discovered. CT, ultrasonography, and MRI of renal masses with fast-scan techniques and intravenous (IV) contrast are the mainstays of evaluation. Dual-energy CT, contrast-enhanced ultrasonography, PET/CT, and percutaneous biopsy are all technologies that are gaining traction in the characterization of the indeterminate renal mass. In cases in which IV contrast cannot be used, whether because of IV contrast allergy or renal insufficiency, renal mass classification with CT is markedly limited. In the absence of IV contrast, ultrasonography, MRI, and biopsy have some advantages. Owing to the low malignant and metastatic potential of small renal cell carcinomas (≤ 4 cm in diameter), active surveillance is additionally emerging as a diagnostic strategy for patients who have high surgical risk or limited life expectancy.

The ACR Appropriateness Criteria are evidence-based guidelines for specific clinical conditions that are reviewed every 3 years by a multidisciplinary expert panel. The guideline development and review include an extensive analysis of current medical literature from peer-reviewed journals and application by the panel of a well-established consensus methodology (modified Delphi) to rate the appropriateness of imaging and treatment procedures. In those instances in which evidence is lacking or not definitive, expert opinion may be used to recommend imaging or treatment.

Key Words: Appropriateness Criteria, renal mass, renal cell carcinoma, renal cyst, diagnostic imaging

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SUMMARY OF LITERATURE REVIEW

Introduction/Background

An indeterminate renal mass is one that cannot be diagnosed confidently as benign or malignant at the time it is discovered. Lesions or masses with character and type clearly defined by the first imaging test are not discussed in this

review. Renal masses are increasingly detected in asymptomatic individuals as incidental findings. CT, ultrasonography, and MRI of renal masses with fast-scan techniques and intravenous (IV) gadolinium are the mainstays of evaluation. Dual-energy CT, contrast-enhanced ultrasonography, PET/CT, and percutaneous biopsy are all technologies

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The ACR seeks and encourages collaboration with other organizations on the development of the ACR Appropriateness Criteria through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.

Variant 1. Patient with normal renal function

Radiologic Procedure	Rating	Comments	Relative Radiation Level
CT abdomen without and with contrast	9	Either CT or MRI is appropriate. Use thin-section CT.	★★★★
MRI abdomen without and with contrast	8	Either CT or MRI is appropriate. See statement regarding contrast in text under "Anticipated Exceptions."	0
Ultrasonography kidney retroperitoneal with duplex Doppler	8		0
Biopsy renal mass	5		Varies
MRI abdomen without contrast	3	This procedure can be useful to characterize simple cysts.	0
Arteriography kidney	1		★★★
X-ray intravenous urography	1		★★★
CT abdomen with contrast	1		★★★
CT abdomen without contrast	1		★★★

Note: Rating scale: 1, 2, and 3 = usually not appropriate; 4, 5, and 6 = may be appropriate; 7, 8, and 9 = usually appropriate.

that are gaining traction in the characterization of the indeterminate renal mass.

CT

CT is the most utilized imaging technique for evaluating the indeterminate renal mass, playing an important role in the characterization of both solid and cystic lesions. Although the majority of lesions are characterized on initial imaging, one definition for the indeterminate renal mass is a lesion containing areas that measure 20–70 Hounsfield units (HU) on noncontrast imaging. Homogeneous lesions measuring <20 HU or >70 HU can be considered benign, whereas lesions either entirely or partially within the 20–70 HU range should be considered indeterminate and warrant further evaluation [1,2].

For those requiring further evaluation, enhancement after IV contrast is key in determining if a renal mass warrants treatment [3]. Enhancing solid renal masses or enhancing components in cystic masses indicates a vascularized mass, and therefore a possible malignancy. The appropriate degree of renal enhancement depends on many factors, including the amount and rate of contrast-material injection, the timing of contrast-enhanced imaging, and the intrinsic characteristics of both the mass and the adjacent renal parenchyma [4,5]. The sensitivity of CT in identifying small renal masses is >90% [6,7]. Proper characterization of a renal mass includes at least 3 phases: noncontrast imaging followed by contrast-enhanced imaging in corticomedullary and nephrographic phases [8] (see Variant 1).

Cystic Renal Masses. The criteria for complex or indeterminate cysts are based on attenuation and contrast

enhancement. A <10-HU increase in attenuation between noncontrast and contrast-enhanced imaging is considered to be within the technical limits of the study and thus is not significant [8-10]. With the introduction of helical and multidetector CT scanners, the degree of pseudo-enhancement can exceed 20 HU [4,11]. Although the evidence from phantom and retrospective clinical studies suggests that a threshold of 20-HU change may be rational [4,12], many still treat a change in attenuation in the 10–20 HU range as indeterminate and suggest that additional imaging, biopsy, or surveillance may be warranted [3,5].

The Bosniak CT classification system for cystic renal masses encompasses the spectrum from simple renal cyst to obvious cystic malignancy, with the likelihood of malignancy increasing with the complexity of the mass. One retrospective review found that the overall incidence of renal cell carcinoma (RCC) in 71 surgically treated cystic lesions was 0% in category II, 20% in category IIF, 55.6% in category III, and 76.9% in category IV [13]. Another review found a malignancy rate in excised Bosniak IIF and Bosniak III cystic renal lesions of 25% and 54%, respectively [14].

A cyst that contains simple fluid (0–20 HU), has a hairline-thin wall, does not contain septa or calcification, and does not enhance with IV contrast is considered category I, a benign cyst. Category II cysts have a hairline-thin wall and may contain a few hairline-thin septa. A hairline-thin calcification or a short segment of slightly thickened but smooth calcification may be seen in category II lesions. These lesions do not show measurable enhancement with IV contrast. Initial reports indicated that category II cysts

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