

Current Status of Imaging for Adrenal Gland Tumors



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KEYWORDS

- Adrenal • Adrenal mass • Adrenal tumor • Adrenal incidentaloma
- Hyperfunctioning adrenal mass

KEY POINTS

- Adrenal masses are common and mostly benign in patients without known malignancy.
- Most adrenal masses can be accurately characterized by contemporary computed tomography, magnetic resonance imaging, and positron emission tomography.
- Computed tomography and magnetic resonance imaging are excellent tools in the detection of clinically suspected hyperfunctioning adrenal mass.
- Appropriate utilization of imaging is important for optimal management, to separate benign inconsequential adrenal masses from those that require treatment.

The adrenal gland is a common site of disease and can harbor a wide range of pathology. Because of expanding clinical indications for cross-sectional imaging and improved spatial resolution of computed tomography (CT), magnetic resonance imaging (MRI) and ultrasound scan, adrenal masses are now frequently discovered incidentally. The prevalence of adrenal masses at CT is approximately 5%,^{1–3} comparable to the estimated prevalence in the general population of 3% to 7%.^{4–6} Most adrenal lesions are benign, most commonly nonfunctioning adenoma. However, the adrenal gland is also a common site of metastasis in oncologic patients. The adrenal gland can also be the source of hyperfunctioning tumors that require intervention and, more rarely, primary malignant neoplasms. Contemporary adrenal imaging is highly accurate in both the detection and characterization of adrenal masses. This article discusses the role of imaging in the evaluation of more common adrenal masses, with primary emphasis on CT and MRI.

PREIMAGING PLANNING

Normal Adrenal Gland

The adrenal glands are well visualized on abdominal CT and MRI. They are located anterosuperiorly to the kidneys within the perirenal space, enclosed by perirenal

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fascia. The normal adrenal glands are homogeneous in density or signal, and have an inverted V or Y shape (Fig. 1). The arterial supply to the glands is via the superior, middle, and inferior adrenal arteries (branches of the inferior phrenic artery, aorta, and renal artery, respectively). The venous drainage of the adrenal glands is predominantly by the central vein, typically draining directly into the inferior vena cava on the right and the caudal path on the left into the left renal vein. The adrenal gland is composed of the adrenal cortex and medulla, 2 functioning units with different embryologic origin and endocrine functions. The adrenal cortex secretes cortisol, aldosterone, and androgen, and the adrenal medulla secretes epinephrine and norepinephrine.

Principles and Rationales for Imaging Studies

The selection of the optimal adrenal imaging modality depends on the reason for imaging, whether the test is for detection or characterization of an adrenal mass, as described in a later discussion. Other factors, such as contrast allergy, renal insufficiency, and radiation concern may also play a role in imaging modality selection.

Detection of an abnormality is finding the lesion, most commonly to assess for metastasis in patients with an established malignancy. In this setting of metastatic workup, contrast-enhanced CT is the most appropriate tool with positron emission tomography (PET) increasingly used in certain malignancies, such as lung cancer. Another important clinical scenario of adrenal mass detection is to localize a suspected hyperfunctioning tumor in a patient with biochemical evidence of hormonal excess. Either CT or MRI is used to localize most of the hyperfunctioning tumors, and occasionally metaiodobenzylguanidine scintigraphy may be necessary to localize a suspected pheochromocytoma.

Characterization of an abnormality is determining lesion histology using imaging. Certain adrenal masses have specific benign diagnostic features at detection, so that further workup is not warranted. However, adrenal masses often have a nonspecific appearance, especially at original contrast-enhanced CT performed for another reason. For these adrenal “incidentalomas,” defined as adrenal masses detected incidentally on an imaging examination performed for other reasons, the imaging goal is to separate a benign mass, most commonly an adenoma, from a mass that requires treatment. CT and MRI are the most commonly used imaging tools in characterizing adrenal masses, with PET usually reserved for patients with known extra-adrenal malignancy. The imaging appearances on these studies reflect physiologic differences of



Fig. 1. Normal adrenal glands in 37-year-old man. Axial contrast-enhanced CT image shows normal adrenal glands in inverted Y configuration.

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