Radiographic Evaluation of Nonfunctioning Adrenal Neoplasms

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KEYWORDS

• Adrenal neoplasm • Incidentaloma • Adrenocortical cancer • CT • MRI • PET

KEY POINTS

- Incidental adrenal neoplasms are usually nonfunctioning benign adenomas.
- After hormonal production has been assessed, the nonsecreting lesions must be evaluated for the possibility of malignancy.
- As radiologic technology advances, a lesion's malignant potential can more accurately be determined, thereby allowing physicians to make more informed treatment recommendations.

ADRENAL INCIDENTALOMA AND RATES OF ADRENOCORTICAL CARCINOMA

Adrenal neoplasms are being discovered more than ever before because of the widespread use of abdominal imaging with CT, MRI, and positron emission tomography (PET). The overall prevalence is 5%, with rates less than 1% in the young and up to 7% in patients more than 70 years of age.[1] The increased identification of these patients mandates the institution of appropriate diagnostic and therapeutic protocols that efficiently and accurately determine which neoplasms are nonfunctioning and benign and which are functioning and/or harbor malignant potential. When lesions are characterized as nonfunctional and benign, they can safely be observed, whereas most functioning and potentially malignant lesions must be excised.

The assessment of incidentally discovered adrenal neoplasms for biochemical function is usually straightforward and has been described in detail elsewhere.[2] However, the radiographic characterization of biochemically inactive adrenal lesions can often be indeterminate. Many findings on CT or MRI are known to predict the benign nature of an adrenal lesion with high accuracy. However, the ability of radiography to confidently assess a lesion's malignant potential is still evolving. This article

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primarily focuses on the radiographic characteristics used to describe adrenal neoplasms, specifically as they relate to the neoplasm's malignant potential.

To appreciate the sheer number of newly identified adrenal neoplasms that will require assessment of malignant potential, one needs to understand the epidemiology of the disease. Historically, autopsy studies document the prevalence of asymptomatic benign adrenal neoplasms ranging anywhere from 2% to 20%,[3] so the number of people with unrecognized adrenal neoplasms is large. Based on a cutoff of 1 cm or larger as defining an adrenal incidentaloma, the prevalence ranges from less than 1% in people younger than 30 years of age up to 7% in those age 70 and older.[4] Fortunately, adrenocortical carcinoma (ACC) accounts for only 0.2% of cancer deaths and has an estimated incidence of 1 to 2 per million.[5]

Traditionally accepted percentages for the most commonly diagnosed conditions associated with adrenal neoplasms are 82% benign adenoma, 5.3% subclinical Cushing syndrome, 5.1% pheochromocytoma, 4.7% ACC, 2.5% metastatic disease, and 1.0% aldosteronoma.[6] Other infrequent diagnoses include adrenal cyst, hemorrhage, lymphoma, sarcoma, and neuroganglioma. However, the true risk of an adrenal incidentaloma being an ACC is estimated as low as 1 in 4000.[7]

Given the rarity of this malignancy, it is paramount to the evaluation and treatment of patients harboring these lesions to proceed judiciously. Even though laparoscopic adrenalectomy allows for the safe removal of adrenal incidentalomas, this does not necessarily justify its frequent use as a diagnostic tool. Since the introduction of laparoscopic adrenalectomy in 1992, there is reasonable evidence that the size threshold for recommending adrenalectomy has decreased.[8] Obviously laparoscopic adrenalectomy is a tremendous advance compared with the open approach and it has revolutionized the care of patients with functioning adrenal neoplasms.[9–11] However, it is still not an acceptable means of resecting ACC, despite literature suggesting it may be.[12] The risks of tumor breakage and inadequate tumor margin, along with higher recurrence rates, make laparoscopic adrenalectomy for ACC unacceptable.[13]

The problem at hand is that approximately 85% of adrenal incidentalomas are nonfunctional and asymptomatic. Most are benign adenomas. The roughly 70% that are lipid-rich are easily characterized. However, the 30% that are lipid-poor are difficult to distinguish from ACC.[14] Epidemiologic statistics overwhelmingly indicate that most of these lipid-poor adrenal incidentalomas are also benign. Cawood and colleagues[15] investigated the true incidence of malignancy in patients with adrenal incidentaloma by performing a literature review excluding surgical and oncological series, which would be expected to bias the results. They reviewed nine series including 1804 subjects and found the incidence of adrenal carcinoma was 1.9% versus the more traditional 5% value that is often reported. Also, metastatic lesions accounted for only 0.7% versus 2.3%. Their study also recognized that mean incidentaloma size decreased with later date of publication, attributed to better imaging quality. These smaller lesions are more likely benign. The development of malignancy during follow-up was only 0.2%. Their review suggests that the false-positive rate for functional or malignant adrenal lesions is initially five times greater than the true positive rate and 50 times greater during follow-up imaging.[15]

Contrary to traditionally quoted rates of ACC, which approached 5%,[6] the likelihood of this diagnosis is less than 1% for all patients with incidentaloma. This discrepancy stems from the previously reported prevalence that was usually based on skewed surgical series, which did not account for the complete denominator of total number of incidentalomas.[15] Current guidelines issued by the National Institutes of Health (NIH) regarding nonfunctioning incidentalomas suggest resection of lesions larger