

RESEARCH ARTICLE

Adrenal incidentalomas: are they being worked up appropriately?

Pooja Sahni, MD¹, Apoorva Trivedi², Abdulkadir Omer, MD³ and Nitin Trivedi, MD, FACE, FACP^{3*}

¹Division of Hematology and Oncology, Stony Brook University School of Medicine, Stony Brook, NY, USA;

²Apoorva Trivedi is a Third Year Medical Student, University of Vermont Medical School, Burlington, VT, USA;

³Division of Endocrinology, Department of Internal Medicine, Saint Vincent Hospital, Worcester, MA, USA

Introduction: Adrenal incidentalomas are defined as masses picked up on imaging studies that were done for apparently different reasons. With frequent use of imaging modalities, incidental adrenal masses are commonly encountered in clinical practice. Guidelines are currently available for the diagnosis and management of adrenal incidentalomas, but the appropriateness of initial work-up and subsequent follow-up of incidental adrenal masses in the community hospital setting is unknown.

Objective: We studied the appropriateness of initial work-up and follow-up of incidental adrenal masses discovered on abdominal computerized tomography (CT).

Methods: In our retrospective study, we reviewed sequential CT scans of the abdomen performed in the month of January 2010 at a community hospital. Once patients with one or more adrenal masses were identified, outpatient charts for initial biochemical testing and follow-up imaging were obtained either through directly accessing the electronic medical records or through contacting primary care physician's offices. Patient charts were reviewed to assess the data for the next 2 years following the discovery of an adrenal abnormality.

Results: Twenty adrenal masses were incidentally discovered on 723 abdominal CTs performed within the month of January 2010 resulting in an overall incidence of 2.76%. Of the patients with incidentally discovered adrenal masses, appropriate biochemical and follow-up imaging were only performed in patients referred to an endocrinologist (2 of 20 patients). Thirty percent of patients with incidental masses received a repeat CT scan for non-adrenal reasons, and no change in the mass size was noted.

Conclusion: Despite published guidelines, the initial work-up and follow-up of patients with an incidentally discovered adrenal mass is unsatisfactory. There is a desperate need for education of providers regarding appropriate work-up of incidental adrenal masses.

Keywords: Adrenal incidentaloma; adrenal mass; adrenal nodule; abdominal CT scan; adrenal metastasis; adrenal tumor; incidental mass

*Correspondence to: Nitin Trivedi, Saint Vincent Hospital, 123 Summer Street, Worcester, MA 01608, USA, Email: trivedinitin1@gmail.com

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Unilateral and bilateral adrenal masses are frequently discovered on abdominal imaging performed for unrelated reasons (1). A majority of adrenal incidentalomas are benign and non-functional, and their prevalence increases with age (1, 2). Guidelines for evaluation of adrenal incidentalomas have been published by the National Institute of Health (3), and the American Association of Clinical Endocrinologists/American Association of Endocrine Surgeons (4). According to the current recommendations, all adrenal incidentalomas should be assessed for functional status and malignant potential at the time of their detection and appropriately followed up.

Furthermore, a detailed characterization of radiological features of adrenal masses for assessment of the potential of malignancy is necessary. While most functional and some malignant masses necessitate surgery, appropriate follow-up is required and often overlooked for masses that are non-functional and non-malignant (5).

Retrospective studies have shown poor compliance with biochemical work-up and follow-up imaging studies recommended by published guidelines (3, 4, 6, 7). The appropriateness of initial work-up and subsequent follow-up of an incidental adrenal mass in the community hospital setting is unknown. Our performance

Table 1. Patient characteristics and follow up

Age/sex	Indication for CT scan	CT scan findings	Biochemical work-up	Endocrinology Referral	Clinical features that may suggest adrenal hyperfunction	Follow-up
1. 62/F	Suspected pyelonephritis	Non-contrast CT. 1.4 cm left adrenal mass with 9–14 HU.	No	No	No	No
2. 49/M	Hepatitis C – suspected hepatoma	CT with and without contrast. 1.7 cm left adrenal mass. No HU reported. Mass same in size as seen on previous CT 2 years back done for abdominal pain.	No	No	No	No
3. 80/M	Abdominal pain. History of colon cancer	CT with and without contrast. 1.1 cm adrenal lesion. HU not reported. Mass same size as seen on previous CT 1 year back.	No	No	No	No
4. 80/F	Altered liver function tests	CT with PO contrast. 3.5 cm left and 2.7 cm right adrenal mass. No HU reported. A pancreatic mass was found.	No	No	No	Died of pancreatic cancer
5. 62/F	Abdominal pain	CT with and without contrast. 2 cm left adrenal mass. HU not described.	No	No	Morbid obesity, hypertension and diabetes	No
6. 78/F	Abdominal pain	CT with and without contrast. 2.2 X 1.7 heterogenous left adrenal mass. No HU described.	No	No	Resistant hypertension	Repeat CT performed for unrelated reason showed no change in the size of adrenal mass
7. 69/M	Colon cancer	CT with and without contrast. 2.7 cm left adrenal mass. No HU reported.	No	No	No	The lesion increased in size from 0.9 cm to 2.7 cm in comparison to CT scan performed before the study period
8. 51/F	Lung nodules	Non-contrast CT. 15 mm adrenal nodule identified in chest CT. Measured HU was 3.	Yes, negative work-up	Yes	Labile hypertension and obesity	2 CT scan performed for adrenal lesion showed no in adrenal mass
9. 83/F	Abdominal pain	Non-contrast CT. 1.2 cm left adrenal lesion. Radiologist ‘fat density suggestive of myelolipoma’.	Only random cortisol	No	Type 2 diabetes and hypertension	Repeat CT done for unrelated reason showed no change of adrenal lesion
10. 96/F	Abdominal pain and rectal bleeding	Non-contrast CT. Bilateral adrenal nodules; right 1.4 (HU27) and left 1.2 (HU34).	No	No	Hypertension	Repeat CT for unrelated reasons did not show any change of adrenal masses
11. 72/M	Lung cancer	CT with and without contrast. 1.7 cm nodule with 86 HU.	No	No	None	Repeat CT showed bilateral adrenal nodules most likely metastatic. The patient died in few months
12. 85/F	Abdominal pain and ventral hernia	CT with and without contrast. 1.3 cm right adrenal nodule. No HU described.	No	No	None	Repeat CT for unrelated reason did not show any change in adrenal mass

Table 1 (Continued)

Age/sex	Indication for CT scan	CT scan findings	Biochemical work-up	Endocrinology Referral	Clinical features that may suggest adrenal hyperfunction	Follow-up
13. 82/M	Abdominal pain and suspected fecal impaction	CT with and without contrast. 1.3 cm left mass with low HU.	No	No	HTN with hypokalemia	Repeat CT for adrenal lesion showed no change in the adrenal mass
14. 95/F	Unclear reasons	CT with and without contrast. 1.3 cm left adrenal mass. No HU described.	No	No	Could not be determined	The patient died in the hospital
15. 67/F	Abdominal pain	CT with and without contrast. HU 54	No	No	No	1 year follow up CT for adrenal nodule did not show change in size of the adrenal nodule
16. 78/M	Lung cancer	CT with and without contrast. 7 mm left adrenal nodule. No HU described.	No	No	No	No
17. 47/F	Abdominal and chest trauma	CT with and without contrast. 2.1 cm adrenal mass. No HU described.	Yes (ordered only)	Yes	Morbid obesity with weight gain. The patient did not do the labs and no showed for her appointment 3 times	Repeat CT done for unrelated reasons showed no change in mass size
18. 50/M	Abdominal pain	CT with and without contrast. 19 by 17 mm right adrenal mass with 10 HU.	No	No	No	Repeat CT for unrelated reason did not show change in the size of adrenal mass
19. 76/F	Unclear	CT with and without contrast. 16 mm left adrenal mass. No HU described.	No	No	No	No
20. 70/F	Diverticulitis	CT with and without contrast. 10 mm left adrenal mass. No HU described.	No	No	No	No

improvement study conducted at a community hospital aimed to evaluate the compliance of our hospital in following up on incidental adrenal masses with subsequent hormonal work-up and imaging suggested by the published guidelines.

Methods

The study was done at a medium-sized teaching community hospital. Using the electronic record system, we were able to generate a list of all patients who have undergone abdominal computerized tomography (CT) scans at our institution during the month of January 2010. The reports of CT scans were reviewed looking for adrenal masses and other abnormalities of the adrenal glands (tumor, bulky, cyst, adenoma, incidentaloma, nodule, and swelling). Once patients with an adrenal mass(es) or other abnormalities were identified, outpatient charts for initial biochemical testing and follow-up imaging were reviewed by either directly accessing the electronic medical records or by calling primary care physician's offices. Patient charts were reviewed for demographics, medical history, indication for abdominal imaging, biochemical investigations, and subspecialty endocrinology consultations used for initial evaluation of the adrenal mass(es). Furthermore, to assess if appropriate follow-up was performed, we also reviewed the patient charts for the 2 years following the initial discovery of the adrenal mass(es) to look for any features indicative of adrenal hormonal overproduction. We specifically searched for documentation of resistant hypertension, features of Cushing syndrome, paroxysmal hypertension, hypokalemia, and hirsutism.

Results

Twenty adrenal masses were incidentally discovered on 723 abdominal CTs performed, with a prevalence of 2.76%. The mean age for patients with one or more incidental adrenal masses was 70.45 ± 14.74 years (mean \pm SD). There were 13 females (65%) and 7 males (35%). The average tumor size was 1.67 ± 0.61 cm (mean \pm SD). Appropriate biochemical and follow-up imaging was only ordered in 2 of 20 patients who were referred to an endocrinologist. One of these two patients referred to an endocrinologist had labile hypertension; however, the work-up was negative for pheochromocytoma. Seven of 20 patients with incidental adrenal mass(es) did not get any hormonal investigation or follow-up imaging studies. Three patients in whom no hormonal work-up was done had features suggesting adrenal hormonal excess. Six patients underwent a repeat CT scan for non-adrenal reasons, and no change in the mass size was noted. The charts of two patients could not be found in our system because these patients did not have primary care physicians affiliated with our hospital. The details of the findings are summarized in the Table 1.

Discussion

We studied the management of incidental adrenal masses in a teaching community hospital setting. The incidence of incidental adrenal lesion(s) in our study was 2.76%, which is similar to the incidence reported in other studies (1, 6–8). Incidental adrenal masses were more commonly seen in older patients with an average age of 70.4 years in our study. In the study by Eldeiry et al., 93% of patients were over 45 years of age (6). Other studies have also reported higher prevalence of incidental adrenal masses in older age groups (7, 8).

Our data showed very poor adherence to the published guidelines (4). Only a small fraction of patients received appropriate biochemical work-up and radiological assessment and follow-up. Even though most incidental adrenal masses are benign and non-functional (6), appropriate work-up suggested by the published guidelines is required in order to diagnose malignant and functional masses. In our study, 2 of 20 patients had probable metastatic lesions; both of these patients died within 1 year of the discovery of their adrenal masses. Three of 20 patients had clinical features that could represent a functional adrenal mass; two of which had resistant hypertension and one of which had morbid obesity, diabetes mellitus, and hypertension. Appropriate work up and treatment of functional adrenal tumors can potentially be curative.

CT scans were ordered for various reasons as depicted in Table 1. One of the important parameters to report on adrenal masses is the attenuation value on unenhanced CT images, also known as the Hounsfield units (HU). Benign masses generally have Low HU (< 10 HU), whereas most malignant mass have high attenuation values (> 20 HU). In our study, the HU was reported in only 6 of 20 patients (30%). Three of the six patients with available HU values had values > 20 units (Table 1). Six of 20 patients in the study had a history of malignancy, and HU was reported in only one of these six patients (Table 1). In the study by Eldeiry et al. (6), only 41% of patients with adrenal incidentaloma(s) had reported HU attenuation values on the CT scan reports.

An endocrinology referral was made in 2 of 20 patients (10%), and an appropriate work-up was accomplished in these two patients. This strongly suggests the need for endocrinology referrals, as specialists typically follow updated guidelines for management.

Our study supports previously published data on the overall lack of adherence to published guidelines for incidental adrenal nodules. Proper work-up will likely improve morbidity and mortality in patients with adrenal incidentalomas. Practice improvement may be accomplished by provider education and flagging the findings of adrenal incidentalomas, which can be easily performed in the modern era of electronic medical records. Finally, referral to an endocrinologist is crucial.

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