



## Original research

## Imaging of adrenal incidentaloma: Our experience



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## ABSTRACT

**Purpose:** To investigate clinical, biochemical and radiological features in 35 patients with adrenal incidentaloma found on CT and/or MRI and to define the management of patients with adrenal masses.

**Material and methods:** From January 2011 and May 2013, 35 patients (19F, 16M) with an adrenal mass incidentally discovered on CT and/or MRI were enrolled in a retrospective study. Thirty-two patients underwent MDCT and eight 1.5 MRI.

**Results:** Patients consisted in 16 males and 19 females, aged between 25 and 89 yo. Adrenal lesions were most commonly found in the sixth decade; in relation to the side of the mass, 20 were found on left side, 15 on the right. Of all the mass analyzed, 3 were <1 cm diameter, 29 between 1 and 4 cm, 3 > 4 cm. The most common finding on CT was adenoma-like appearance (19 cases in relation to size, 14 in relation to attenuation values). Hormonal analysis showed 32 cases of nonfunctional masses and 3 cases of hormone activity. Adrenalectomy was performed in ten patients having adenoma (5 cases), malignant lesions (2 cases), pheochromocytoma, cyst and myelolipoma (1 case).

**Conclusion:** Diagnostic approach to adrenal incidentaloma is focused on the definition of malignancy and hormonal activity; the characterization is needs hormonal and radiological (CT and/or MRI) evaluation, even if a fine needle aspiration is needed in selected cases.

Benign and/or non-hypersecreting hormone lesion with <4 cm diameter could be sent to follow-up; active adrenal tumors or >4 cm diameter lesions with malignancy suspicious or growth during follow-up could be treated with surgical adrenalectomy.

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## 1. Introduction

Adrenal lesions greater than 1 cm detected during non-invasive abdominal imaging techniques performed for unrelated reasons are called “adrenal incidentaloma” or “diseases of modern technology”.

The frequency of adrenal incidentaloma has grown with the advancements in imaging technology (US, CT, MRI and scintigraphy); the prevalence increases with age [1], although the higher incidence is reported between 50 and 70 years mainly in patients with diabetes mellitus, hypertension and obesity; there is no difference in prevalence based on race and sex.

The incidence of adrenal nodules at autopsy is between 8.7% [1] and 32% of patients without suspicion of adrenal disease [2–4].

The differential diagnosis includes non-hypersecreting adrenal adenoma, hypersecreting adrenal adenoma (Subclinical Cushing's syndrome, pheochromocytoma, primary aldosteronism), primary adrenal carcinoma, metastases and other adrenal masses (myelolipoma, cyst or ganglioneuroma).

Diagnostical approach includes the differentiation between benign/malignant lesions and functional/nonfunctional lesions; it requires a clinical and biochemical work-up. 80% of adrenal lesions is non-hypersecreting adenoma, with size less than 2 cm [1].

It is necessary to know if the patient has a present or past cancer diagnosis, because in these patients the incidence of malignancy is between 30 and 50% [5]; in patients without history of cancer, malignancy is very rare. There is a correlation also between malignancy and size of the lesion: malignancy suspicion increases with the mass diameter [6–8].

Surgery is indicated only in a small fraction of cases, because small and hormonally inactive lesions predominates among suspected masses.

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Objective of the study is to investigate clinical, biochemical and radiological features in 35 patients with adrenal incidentaloma found on CT and/or MRI and to define the management of patients with adrenal masses.

## 2. Material and methods

### 2.1. Study population

From January 2011 and May 2013, 35 patients (19F, 16M) with an adrenal mass incidentally discovered on CT and/or MRI were enrolled in a retrospective study.

No subjects who had adrenal mass discovered on these exams presented adrenal symptoms; they had undergone diagnostic exams for other causes, such as abdominal hernias, cholecystitis, other urinary or abdominal symptoms.

Demographic characteristics collected for patients were: sex, age, medical history, diameter and side of the lesion, endocrine function, follow-up and/or histological findings of surgical adrenalectomy.

We also evaluated Hounsfield Units (HU), before and after contrast media administration in benign and malignant lesions at CT exams and Absolute Chemical Shift on MRI.

In relation to endocrine functionality, all patients underwent to hormone tests relating to pheochromocytoma, subclinical Cushing's syndrome, aldosterone primary adenoma.

### 2.2. Imaging

Thirty-two patients underwent MDCT (Toshiba, Aquilion 4, Tokyo, Japan) and 8 1.5 MRI (Siemens Symphony 1.5 Erlangen, Germany).

#### 2.2.1. MDCT

The patient was moved to the CT room where scout-view and volumetric scan were carried out. A layer no wider than 3 mm and a reconstructing interval no larger than 5 mm were chosen (kVp: 120, mA: 250; pitch 1).

Iodinated contrast agent was injected intravenously, 1.5 ml iodine/kg body weight (BW) through a mechanic injector at a concentration of 400 mg iodine/mL (contrast agents "Iomeprol" and "Iomeron 400" developed by the Italian pharmaceutical company Bracco) and a flow speed of 2.5 ml/s. The dedicated examination protocol comprise a precontrast CT and two post-contrast scanning (at 35 s and a delayed scanning at 10 min after contrast media injection started).

#### 2.2.2. MRI

All MRI imaging studies were performed on 1.5-T closed magnet (Magnetom Symphony, Siemens, Germany). All patients were supine imaged with a body-phased-array receiver coil.

After an initial localizer in three different planes, the study protocol included:

- T2-W Haste Multiple Breath Hold (MBH), T1-W f12d in-out of phase, T1-W f12D Fat suppressed on axial phase; T2-W Haste MBH, T2-W Trufi BH on coronal plane;
- T1-W FLASH 3D Fat suppressed in axial plane, before contrast media administration;
- 4 sequential scans with 20 s interval and tardive acquisition 10 min after (T1-W FLASH 3D Fat Suppressed in axial plane after Gd-DTPA (0.1 mmol/kg)).

During post-processing examination, Region of Interest (ROI) were used for densitometric evaluation on CT exam and signal

intensity in in-out of phase MRI; ROI were realized in relation to lesion diameter excluding calcifications and or fluid areas on CT and/or MRI.

ROI value of intensity signal on T1-W f12d in-out phase to calculate Absolute Chemical Shift (ACS) were included in the form:

$$\frac{[(SIIP - SIOP)/SIIP] \times 100}{[SIIP: \text{signal intensity in phase}; SIOP: \text{signal intensity out of phase}]}$$

## 3. Results

Of 35 patients, three were <40 yo, seven between 40 and 50 yo, twelve between 50 and 60 yo, ten between 60 and 70 yo, 3 over >70 yo. Adrenal lesions are more frequent in the age between 50 and 70 yo.

There were 19 females, 16 males; 27 patients underwent MDCT, 3 MRI, 5 underwent MDCT and MRI and one patient underwent also scintigraphy.

Of the 35 lesions detected, 20 were on left side, 15 on the right side; no bilateral lesions were detected; 3 were functional, 32 were nonfunctional masses (Table 1).

In relation to lesion diameter, 3 were <1 cm, 29 with a size between 1 and 4 cm, 3 presented a diameter >4 cm.

The location, size and shape of lesions were determined with CT and MRI and it was found that 19 subjects had features of adenoma; 18 of these 19 patients were less than 4 cm in size.

Cushing syndrome was detected in 4 patients, pheochromocytoma in 5, malign lesion and myelolipoma in one case (Table 2).

Measurement of HU by nonenhanced CT yielded 7 subjects and 3 subjects out of 14 patients with adenoma-like appearance with less than 10 HU and over 20 HU, respectively.

Conversely, measurement less than 10 HU and between 10 and 20 HU were observed in the two patients with pheochromocytoma-like appearance lesions (Table 3).

Semiquantitative study of Pre and Postcontrast media injection on MDCT at 35 s (wash in) and 10 min (wash-out) and absolute Chemical Shift in MRI with a cut-off of 16.5%, demonstrated substantial differences, as shown in Table 4.

Patients with <4 cm diameter adrenal lesions, with endocrine negative tests, were sent to follow-up with CT after 3–6 months and then every year for three years with endocrine reevaluation every year.

**Table 1**  
Characteristics of 35 adrenal incidentaloma.

Characteristics	No
<b>Age (yo)</b>	
<40	3
40–50	7
50–60	12
60–70	10
>70	3
<b>Sex</b>	
Male	16
Female	19
<b>Site</b>	
Right	15
Left	20
Bilateral	0
<b>Functionality</b>	
Yes	3
No	32
<b>Exams</b>	
CT	27
MRI	3
CT and MRI	5
Scintigraphy	1

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