Original Article *Özgün Araştırma*

DOI: 10.4274/Tjem.2430

The Prevalence of Incidental Adrenal Mass Found Using Diagnostic Imaging Techniques

Görüntüleme Tekniklerinde Adrenal Insidentaloma Prevelansı

Hacer Şen, Mehmet Aşık*, Fatma Uysal**, Betül Kızıldağ**, Emine Binnetoğlu, Fahri Güneş, Gökhan Erbağ, Kubilay Ükinç*

Çanakkale Onsekiz Mart University, Internal Medicine, Çanakkale, Turkey
*Çanakkale Onsekiz Mart University, Endocrinology, Çanakkale, Turkey
**Çanakkale Onsekiz Mart University, Radiology, Çanakkale, Turkey

Abstract

Purpose: Incidentally-found adrenal masses detected by imaging studies performed for unrelated reasons have become more common in the clinical practice. Our study aims to assess the nature and prevalence of incidental adrenal masses discovered on CT or MRI in patients without malignancy.

Material and Method: We analyzed the reports of 8378 abdomen or chest CT and 820 abdominal MRI examinations performed on 4973 patients in our hospital. We found 629 (12.6%) incidental adrenal masses. We excluded 194 (3.9%) patients with known cancer or high-risk adrenal metastasis. The remaining 435 (8.7%) adrenal masses constituted the study group. This group consisted of 274 (5.9%) patients [123 (44.9%) women and 151 (55.1%) men] with masses greater than 1 cm in diameter and 161 (2.8%) patients with masses less than 1 cm.

Results: The mean age of the patients was 62.55±13.23 years. Unilateral adenoma was the most common type of adrenal masses (n=112, 40.9%). Less commonly observed adrenal masses were: unilateral [n=79 (28.8%)] and bilateral [n=35 (12.8%)] macronodular hyperplasia, unilateral [n=33 (12%)] and bilateral [n=2 (0.7%)] diffuse adrenal thickness, bilateral adenoma [n=7 (2.6)], unilateral [n=3 (1.1%)] and bilateral [n=3 (1.1%)] micronodular hyperplasia. The masses were most commonly found in the left adrenal gland (165, 60.2%). They were found at lower rates in the right adrenal gland (66, 24.1%) and bilateral adrenal glands (43, 15.7%). The mean sizes of left and right adrenal masses were 1.89±1.11 cm and 2.02±0.86 cm, respectively.

Discussion: Patients harbouring adrenal incidentalomas should be evaluated for the possibility of malignancy and/or hormone activity. The lack of controlled studies impedes specific management and recommendations for adrenal incidentalomas. Large prospective controlled studies on this topic are needed. *Turk Jem 2013; 17: 108-10*

Key words: Adrenal mass, incidentaloma, prevalence

Özet

Amaç: Rutin yapılan görüntüleme çalışmalarında, tesadüfen tespit edilen adrenal kitleler klinikte sık karşımıza çıkmaktadır. Bu çalışmamızda malignitesi olmayan hastalarda yapılan CT ve MRI tetkiklerinde, adrenal insidentaloma yaygınlığını değerlendirmeyi amaçladık.

Gereç ve Yöntem: Hastanemizde 4973 hastada yapılan 8378 karın ve göğüs bilgisayarlı tomografi ile 820 karın magnetik rezonans tetkiklerinin raporları incelendi. Altı yüz yirmi dokuz olguda (%12.6) adrenal kitle saptandı. Malignitesi ve adrenal metastaz riski yüksek olan 194 (%3,9) hasta çalışmaya alınmadı. Dört yüz otuz beş (%8,7) adrenal kitlesi olan hasta çalışmaya dahil edildi.

Bulgular: Çalışmaya dahil edilen 435 hastanın, 274'ünde (5,9%) 1 cm'den büyük ve 161'inde (2,8%) 1 cm'den küçük adrenal kitle olduğu belirlendi. 1cm'den büyük kitlesi olan hastaların 123'ü kadın, 151'i erkek hastaydı ve yaş ortalamaları 62,55±13,23 idi. Hastalarda en sık tek taraflı adenom (n=112, 40,9%), daha az sıklıkta da tek taraflı [n=79 (28,8%)] ve bilateral [n=35 (12,8%)] makronodüler hiperplazi, tek taraflı [n=33 (12%)] ve bilateral [n=2 (0,7%)] difüz adrenal kalınlık, bilateral adenoma [n=7 (2,6%)], tek taraflı [n=3 (1,1%)] ve bilateral [n=3 (1.1%)] mikronodüler hiperplazi tespit edildi. Hastaların en sık sol adrenal bezinde kitle tespit edildi (165, 60,2%). Sağ adrenal bez ve bilateral adrenal tutulum daha nadirdi (n,%: 66, 24,1% and 43, 15,7%, sırasıyla). Ortalama sağ ve sol adrenal bez boyutları sırasıyla 1.89±1.11 cm ve 2,02±0,86 cm idi. Unilateral [n=79 (28,8%)] and bilateral [n=35 (12.8%)] macronodular hyperplasia, unilateral [n=33 (12%)] and bilateral [n=2 (0,7%)] diffuse adrenal thickness, bilateral adenoma [n=7 (2,6%)], unilateral [n=3 (1,1%)] and bilateral [n=3 (1,1%)] micronodular hyperplasia.

Tartışma: Adrenal insidentalomalı hastalar malignite yada hormon aktivitesi açısından mutlaka değerlendirilmelidirler. Adrenal insdentalomalar için spesifik tedavi ve öneriler için daha geniş prospektif çalışmalara ihtiyaç vardır. *Turk Jem 2013; 17: 108-10*

Anahtar kelimeler: Adrenal kitle, insidentaloma, prevelans

Address for Correspondence/Yazışma Adresi: Hacer Şen MD, Çanakkale Onsekiz Mart University, Internal Medicine, Çanakkale, Turkey
Gsm: +90 505 481 21 33 E-posta: hcrgrsy@hotmail.com **Received/Geliş Tarihi:** 04.12.2013 **Accepted/Kabul Tarihi:** 04/02/2014

Introduction

Adrenal incidentalomas (AIs) are masses coincidentally found during abdominal or thoracic imaging performed for other reasons. It is difficult to know the true prevalence of this entity because of varied definitions and variability in methods used for imaging. The prevalence of adrenal tumors when established by computed tomography (CT) varies from 2.5 to 4% for abdomen CT, and 4.2% for thorax CT in adult populations (1-3). The prevalence of AI detected at autopsy is less than 1% in patients younger than 30 years of age, increasing to 7% in patients 70 years of age or older (4).

These masses are mainly non-secreting and benign. However, it is still an important clinical problem, because there can be a risk for malignancy or hormonal hyperfunction. All adrenal incidentalomas should be evaluated for these potential problems (3,5).

The primary aim of this study was to determine the number of cases of AI diagnosed by CT scans of the thorax and abdomen and magnetic resonance imaging (MRI) scans of the abdomen performed on adult patients attending our hospital between 2009 and 2012.

Material and Methods

Patients

We performed a retrospective review of the medical records of all patients with incidental adrenal mass discovered on CT or MRI between January 2009 and December 2012 at our institute. We analyzed the reports of 8378 abdomen or chest CT and 820 abdominal MRI examinations performed on 4973 patients in our hospital during this period. We found 629 (12.6%) incidental adrenal masses while browsing. We excluded 194 (3.9%) patients with a known malignancy or high-risk adrenal metastasis. The remaining 435 (8.7%) adrenal masses constituted the study group. This group consisted of 274 (5.9 %) patients with masses greater than 1 cm in diameter and 161 (2.8%) patients with masses less than 1 cm. The number and size of the adrenal mass in each patient was recorded.

A laboratory database review of the patients with AI was performed. Biochemical and radiological data, and demographic details were recorded. According to the guidelines, a sufficient endocrine evaluation included a 1 mg overnight dexamethasone suppression test to assess for Cushing's disease, a 24-hour collection of urinary metanephrines and normetanephrines, and plasma aldosterone and renin activity (5).

Imaging Methods and Analysis

Abdominal and chest CT scans comprised the initial scans. A helical CT (4-MDCT Asteion, Toshiba Medical Systems) was used for all investigations. Abdominal CT, both unenhanced and contrast-enhanced scans, were used to diagnose incidental adrenal lesions. Scans were completed during the portal venous phase (60-70 seconds) after 100 ml low-osmolar contrast material was administered intravenously. Collimation was 3 to 7 mm depending on the scanner used, body part to be imaged and the year of investigation. The majority of chest CT examinations were unenhanced. For contrast-enhanced chest CT 100 ml low osmolar contrast material was given intravenously during routine procedures.

Characterization of the incidentally-discovered adrenal mass was completed by using unenhanced CT, dedicated adrenal CT with contrast washout, or adrenal MRI with chemical shift imaging.

Adrenal CT was performed as follow-up investigation to identify the adrenal mass discovered. Unenhanced slices were obtained with 2.5 mm collimation through the adrenal glands. The field of view was 25-28 mm on average. The region of interest (ROI), an ellipse in the adrenal mass, was identified and measured. If the ROI was greater than 10 H, 100 ml non-ionic contrast material was administered intravenously at 3 ml/s. Imaging was repeated 60 s after injection and again 10-15 minutes later, keeping imaging parameters constant.

Adrenal MRI was completed with a variety of equipment including 1.5 T systems (Signa HDx, GE Healthcare). Where possible, a phased-array body coil was preferred. A 2-D gradient-refocused echo sequence was used to obtain T1-weighted inphase and opposed phase axial breath hold images. The parameters were: TR range: 110 milliseconds, in-phase TE range: 4.6 milliseconds, and opposed-phase TE range: 2.4 milliseconds. Additional parameters were: flip angle: 80°, field of view: 44x44 cm, slice thickness: 4 mm, intersection gap: 0.5 mm, and 1 signal acquisition. A T2-weighted sequence was included in all investigations, though the technique varied.

Results

The patients with masses greater than 1 cm comprised 274 patients [123 female (44.9%) and 151 male (55.1%)] (5.9%). The mean age of the patients was 62.55±13.23 years. The most common kind of adrenal mass was unilateral adenoma (n=112, 40.9%). Less commonly observed adrenal masses were: unilateral [n=79 (28.8%)] and bilateral [n=35 (12.8%)] macronodular hyperplasia, unilateral [n=33 (12%)] and bilateral [n=2 (0.7%)] diffuse adrenal thickness, bilateral adenoma [n=7 (2.6)], unilateral [n=3 (1.1%)] and bilateral [n=3 (1.1%)] micronodular hyperplasia The masses were most commonly seen in the left adrenal gland (165, 60.2%). They were less common in the right adrenal gland and bilateral adrenal glands (n,%: 66, 24.1% and 43, 15.7%, respectively). The mean sizes of left and right adrenal masses were 1.89±1.11 cm and 2.02±0.86 cm, respectively (Table 1). Evaluation of adrenal incidentalomas in the hormone system was performed in only 13 patients (4.7%). The results were non-functional masses, Cushing's syndrome, primary aldosteronism, and pheochromocytoma (n,%=8, 2.9%; 3, 1.1%; 1, 0.4%, 1, 0.4%) respectively.

Discussion

Adrenal masses are being discovered more frequently with the development of imaging techniques. There have been some studies on the prevalence of AI, with different results. The prevalence of AI in a study by Herrera et al. analyzing CT scans done between 1985 and 1989 was 0.4% (6). Using a similar method, Song et al. examined the CT scans in 65231 patients performed between 2000 and 2003 and reported a prevalence of 5% (7). Developments in imaging technology during the time between the two studies may be responsible for the increase in AI prevalence. Additionally,

Table 1. General data of the 274 patients	
Age (year)	62.55±13.23
Gender	
M	151 (55,1%)
F	123 (44,9%)
Side of the mass	
Right	66 (24,1%)
Left	165 (60.2%).
Bilateral	43 (15.7%)
Diagnostic technique	
CT (Abdominal+thorax)	8378
Abdominal MRI	820
Mass size	
Left adrenal	1.89±1.11 cm
Right adrenal	2.02±0.86 cm

Davenport et al. examined thorax and abdomen CT scans performed for any reason between 2006 and 2007 and found that the prevalence of AI detected by thorax CT and abdomen CT was 0.81% and 0.98%, respectively (8). They linked these low rates to the fact that more specific scanning for adrenal adenoma is done in a research protocol while a typical radiology department focuses on the patient's presenting complaint. In our study, when the results of radiological examination done for any reason were retrospectively evaluated, it was found that AI prevalence was 5.9%. In spite of not performing any specific radiological investigation for AI, contrary to the other studies, we determined a higher rate of incidence.

When AI is identified, it should definitely be evaluated to see if the lesion shows hormonal activity or not and whether it is benign or malignant. The guidelines for this evaluation have been determined by the NIH state-of-the-science statement on management of the clinically inapparent adrenal mass (5).

Each patient should be evaluated for pheochromocytoma, primary hyperaldosteronism, Cushing's syndrome and for the presence of virilising or feminising tumours. According to the test results, surgical or non-surgical treatment of the mass should be given. In a study, Mantero et al. investigated 1096 patients with identified AI between 1980 and 1995. According to the results of hormonal work-up, 85% of the masses were nonhypersecretory, 9.2% were subclinical Cushing's syndrome, 4.2% were pheochromocytoma and 1.6% were aldosteronomas (9). In their study, Golgowski et al., found excess hormone synthesis in 13.6% of subjects, pheochromocytoma in 7.4%, subclinical hypercortisolism in 4.8%, and primary hyperaldosteronism in 1.4% of patients with AI (10). In a study by Kasperlik-Zaluksa et al., of 1790 AI patients, 1590 subjects were found to have benign tumors and malignancy was detected in 200 patients. Subclinical adrenal hyperfunction was detected in 140 patients (8%), most frequently pre-Cushing's syndrome (6%), while subclinical hyperaldosteronism and hyperandrogenism were diagnosed in only 1%. Pheochromocytoma was found in 58 patients (3% of the whole group) (11). Comlekci et al. investigated clinical haracteristics, metabolic parameters and follow-up findings in 376 patients with AI. 73.5% of subjects had non-functional masses while 12.5% had subclinical Cushing's syndrome (12). In our study, only few patients with AI were evaluated for hormonal activity. Although all patients diagnosed with AI were referred to the endocrinology department, those with no complaints, or who attributed their complaints to some other cause, did not attend the endocrine clinic, thus, hormonal investigation could not be performed in the majority of patients. Apart from internal medicine and endocrinology clinics, initiatives to increase awareness on the need for evaluation of incidentally-found adrenal masses from the point of view of malignancy and hormonal hyperfunction may help to solve this problem.

Studies in recent years have frequently emphasized the relationship of AI with metabolic syndromes, insulin resistance and coronary artery disease. Studies on AI patients have discovered a frequent correlation between AI and metabolic syndrome characteristics, such as impaired glucose tolerance, elevated blood pressure and high triglyceride levels (13). A study by Dalmazi et al. found the relationship of increasing patterns of subclinical hypercortisolism with increased prevalence of adverse metabolic and cardiovascular events, independently of other potential risk factors (14). Evaluation and monitoring of all patients with AI should include screening for metabolic syndromes, diabetes mellitus and coronary artery disease. In this study, the first on AI prevalence in Turkey, we observed that the prevalence of AI detected during radiological investigations for any reason was higher compared to that in previous papers. In our center, a special training would contribute to raising awareness on the need for careful evaluation of incidentally-found adrenal masses from the point of view of malignancy and hormonal hyperfunction. In addition, prospective, multi-centre studies on this topic are needed in our country.

References

1. Ferreira EV, Czepielewski MA, Faccin CS, Accordi MC, Furtado AP. Prevalence of adrenal incidentaloma at computed tomography (chest and abdominal) in a general hospital in Brazil. Arq Bras Endocrinol. Metabol 2005;49:769-75.
2. Bovio S, Cataldi A, Reimondo G, et al. Prevalence of adrenal incidentaloma in a contemporary computerized tomography series. J Endocrinol Invest 2006;29:298-302.
3. Young WF Jr. Clinical practice. The incidentally discovered adrenal mass. N Engl J Med 2007;356:601-10.
4. Grumbach MM, Biller BM, Braunstein GD, et al. Management of the clinically inapparent adrenal mass ("incidentaloma"). Ann Intern Med 2003;138:424-9.
5. No authors listed. NIH state-of-the-science statement on management of the clinically inapparent adrenal mass ("incidentaloma). NIH Consens State Sci Statements 2002;19:1-25.
6. Herrera MF, Grant CS, van Heerden JA, Sheedy PF, Ilstrup DM. Incidentally discovered adrenal tumors: an institutional perspective. Surgery 1991;110:1014-21.
7. Song JH, Chaudhry FS, Mayo-Smith WW. The incidental adrenal mass on CT: prevalence of adrenal disease in 1,049 consecutive adrenal masses in patients with no known malignancy. AJR Am J Roentgenol 2008;190:1163-8.
8. Davenport C, Liew A, Doherty B, et al. The The prevalence of adrenal incidentaloma in routine clinical practice. Endocrine 2011;40:80-3.
9. Mantero F, Terzolo M, Arnaldi G, et al. A survey on adrenal incidentaloma in Italy. Study Group on Adrenal Tumors of the Italian Society of Endocrinology. J Clin Endocrinol Metab 2000;85:637-44.
10. Golkowski F, Buziak-Bereza M, Huszno B, Orlowska M. Adrenal incidentaloma as essential clinical problem in modern endocrinology. Przegl Lek 2005;62:761-4.
11. Kasperlik-Zaluska AA, Slowilska-Srzednicka J, Roslonowska E, et al. Bilateral, incidentally found adrenal tumours - results of observation of 1790 patients registered at a single endocrinological centre. Endokrynol Pol 2010;61:69-73.
12. Comlekci A, Yener S, Ertilav S, et al. Adrenal incidentaloma, clinical, metabolic, follow-up aspects: single centre experience. Endocrine 2010;37:40-6.
13. Terzolo M, Pia A, Alì A, et al. Adrenal incidentaloma: a new cause of the metabolic syndrome? J Clin Endocrinol Metab 2002;87:998-1003.
14. Di Dalmazi G, Vicennati V, Rinaldi E. Progressively increased patterns of subclinical cortisol hypersecretion in adrenal incidentalomas differently predict major metabolic and cardiovascular outcomes: a large cross-sectional study. Eur J Endocrinol. 2012;166:669-77.