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Research Article

Prevalence of Adrenal Incidentaloma by Chest Computed Tomography in Patients with a Preliminary Diagnosis of COVID-19 Pneumonia

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Abstract

Aim: Adrenal incidentalomas are typically discovered as an incidental finding during routine computed tomography (CT) or magnetic resonance imaging (MRI) scans conducted for unrelated purposes. Our objective was to examine the frequency of adrenal incidentaloma, in individuals who underwent thoracic CT scan as a result of Covid-19 infection.

Material and Methods: In the retrospective descriptive study, 808 patients who applied to the emergency radiology department with the suspicion of covid 19 and underwent thoracic CT between March 2020 and July 2020 were included. The presence of incidentaloma in the CT images of the patients was evaluated.

Results: Adrenal incidentaloma was detected in 78 (9.7%) of the 808 patients, and of those 78 adrenal incidentalomas, 70 (8.7%) were unilateral and 8 (1%) were bilateral. The mean diameter of the adrenal incidentaloma was 20 mm, and it was 18.5 mm in females and 21.5 mm in males. A total of 808 patients, 351 (43.4%) females and 457 (56.6%) males, were included in the study.

Conclusion: Adrenal incidentaloma have become more common radiological findings with the recent COVID-19 pandemic due to the increased frequency of CT scans, and it is important to appropriately manage these patients.

Keywords: Adrenal incidentaloma, COVID-19 infection, chest CT

INTRODUCTION

An adrenal incidentaloma (AI) refers to the presence of an asymptomatic adrenal mass with a diameter exceeding 1 cm, which is fortuitously detected during imaging procedures unrelated to suspected adrenal disease (1). Upon detection, these tumors necessitate radiological and biochemical evaluation to determine their potential for malignancy and whether they secrete excessive hormones (2).

In December 2019, a novel coronavirus was identified during the examination of lower respiratory tract samples obtained from several individuals exhibiting viral pneumonia in Wuhan, Hubei, China (3). This virus, known as novel coronavirus disease 2019 (COVID-19), rapidly spread worldwide, causing a pandemic and persisting in its impact (3). The severe acute respiratory syndrome coronavirus (SARS-CoV) and the Middle East respiratory syndrome coronavirus (MERS-CoV) are previously identified viral infections with similar features to COVID-19 (4,5). These zoonotic viruses give rise to significant respiratory tract complications (6).

In the present era, computed tomography (CT) has become widely available in nearly all hospitals, and chest CT imaging has gained popularity due to its ease of accessibility in facilitating early diagnosis of these diseases (7).

Since the 1980s, the extensive use of high-resolution imaging techniques like CT and magnetic resonance

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imaging (MRI) has posed a notable clinical challenge in identifying incidentally detected adrenal gland lesions, such as adrenal incidentalomas (8). Furthermore, the increased utilization of chest CT examinations across all age groups for the diagnosis of COVID-19 pneumonia has resulted in a higher frequency of incidental adrenal lesions being detected and encountered by radiologists.

The primary objective of this study was to assess the incidence of adrenal incidentalomas in patients admitted to our hospital who underwent chest CT scan as part of the initial diagnostic workup for COVID-19.

MATERIAL AND METHOD

This study protocol received approval from both the local ethics committee of Trakya University School of Medicine (TUTF-BAEK 2020/295) and the COVID-19 Scientific Research Committee of the Republic of Turkey Ministry of Health. Between March 2020 and July 2020, a total of 948 chest CTs were performed in our hospital for the preliminary diagnosis of COVID-19 pneumonia.

The selection and description of the participants

In our retrospective study we included 808 patients. 128 patients due to known history of primary cancer and 12 patients due to poor image quality in lung CT were excluded from the study.

Technical information

Patient with suspected COVID-19 infection were scanned on an eight-channel multislice Toshiba Aquilion 64 CT scanner (Toshiba Medical Systems, Tokyo, Japan). The imaging procedure involved the patient lying supine and holding their breath in a suspended state, while axial images were acquired from the thoracic inlet down to the mid-abdominal region. The images were produced on a multi-detector CT using 120 kVp, 240–400 mA (according to patient body weight and sex), 80 mm × 0.5 mm collimation, and reconstructed at 1 mm slice thickness. The gantry rotation time was 0.5 s per rotation. The field of view was maximum 500 mm and an acquisition matrix of 512×512 was used. Contrast agent was not administered in the CT examinations. Sagittal and coronal images were used at the workstation (Sectra PACS Linköping, Sweden) to confirm the diagnosis after the CT data was sent there electronically.

Image analysis

The research covered all patients with adrenal incidentaloma. Both adrenal glands were assessed in each patient utilizing axial images on an abdomen soft tissue setup (window level 40 HU; width 400 HU). Measurements were taken by blinded radiologists with 10 years of experience in radiology. While measuring for adrenal incidentalomas, only the long axis of the lesion was measured and evaluated in the axial plane (Figure 1).

At the same time, the densities of the detected lesions were examined, and lesions with a density less than 10 Hounsfield Unit (HU) were considered as lipid-rich adenoma, and those with a higher density were considered as high-density lesion.

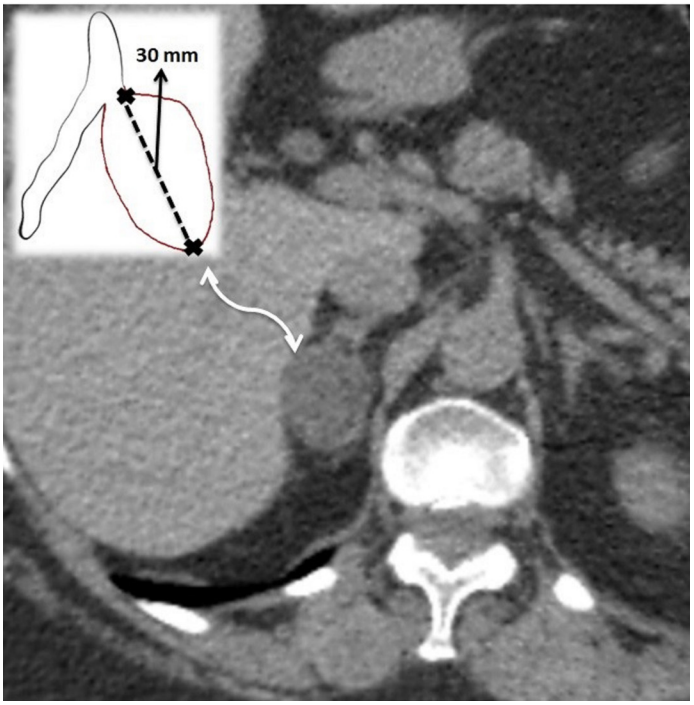

Figure 1. Long axis measurement of adrenal incidentalomas in the axial plane

Statistics

Statistical analyses were carried out using the SPSS 22.0 (IBM, Armonk, NY, USA) software package. While categorical data distribution information is given as a percentage, numerical data distribution information is expressed as the mean±standard deviation (SD). To analyze the normal distribution of numerical data, the Kolmogorov Smirnov test was applied. An independent sample t-test was used to compare the two independent groups. To compare categorical variables, the Pearson-chi-square test was used. The significance level was considered as $p<0.05$.

RESULTS

A total of 808 patients, 351 (43.4%) females and 457 (56.6%) males, were included in the study. The median patient age in our study was 62 (18–97) years. Incidentaloma rates by age are given in Table 1. While the mean age of the patients with incidentaloma was 69.5±13.9, the mean age of the patients who were not detected incidentaloma was 57.6±20.4 years. It was found that the mean age of cases with incidentaloma was significantly higher than those without ($p<0.001$). There was no significant difference in terms of gender distribution between cases with and without incidentaloma ($p=0.338$).

Adrenal incidentaloma was detected in 78 (9.7%) of the 808 patients, and of those 78 adrenal incidentalomas, 70 (8.7%) were unilateral and 8 (1%) were bilateral. The rate of insidentolama was 10.8% in women and 8.8% in men. No significant difference was observed between genders in terms of incidentolama rate ($p=0.323$).

Table 1. Adrenal incidentaloma distributions by age

Age (years)	Incidentaloma n (%)	No incidentaloma n (%)	Total n (%)
18-19	-	13 (1.6)	13 (1.6)
20-29	1 (0.2)	82 (10.1)	83 (10.3)
30-39	1 (0.1)	75 (9.3)	76 (9.4)
40-49	5 (0.7)	82 (10.1)	87 (10.8)
50-59	10 (1.3)	110 (13.6)	120 (14.9)
60-69	17 (2.1)	113 (14)	130 (16.1)
70-79	23 (2.7)	125 (15.5)	148 (18.2)
80-89	17 (2.1)	112 (13.9)	129 (16)
90-97	4 (0.5)	18 (2.2)	22 (2.7)
Total	78 (9.7)	730 (90.3)	808 (100)

Values are expressed as n (%), n: number

The distribution of the lesions by gender are given in Table 2. The mean diameter of the adrenal incidentaloma was 20 mm, and it was 18.5 mm in females and 21.5 mm in males. There was no statistically significant difference between genders in terms of lesion diameter (p=0.088)

Table 2. Adrenal incidentaloma distributions by gender

Gender	Adrenal incidentaloma			
	Absent n (%)	Unilateral n (%)	Bilateral n (%)	Total n (%)
Female	313 (89.2)	33 (9.4)	5 (1.4)	351 (100)
		38 (10.8)		
Male	417 (91.2)	37 (8.1)	3 (0.7)	457 (100)
		40 (8.8)		
Total	730 (90.3)	70 (8.7)	8 (1)	808 (100)
P value	0.323*			

Values are expressed as n (%), n: number, *Chi square test

The radiological findings of incidentaloma lesions observed on non-contrast computed tomography are summarized in Table 3 and in Figure 2. When we examined the average HU among different groups, it was determined that in the lipid-rich adenoma group, the mean value was 2.51±16.56 HU (ranging from -34 to 70). For high-density lesions, the mean value was 39.4±16.44 HU (ranging from 13 to 69). In cases of adrenal hemorrhage, the mean value was 55.0±25.40 HU (ranging from 37 to 73). Lastly, in the myelolipoma group, the mean value was -17.50±84.10 HU (ranging from -77 to 42).

Tablo 3. Non-contrast CT Findings of Incidentalomas

	Adrenal incidentaloma n (%)
Lipid-rich adenoma	43 (55.1)
High density lesion	31 (39.7)
Adrenal hemorrhage	2 (2.6)
Myelolipoma	2 (2.6)
Total	78 (100)

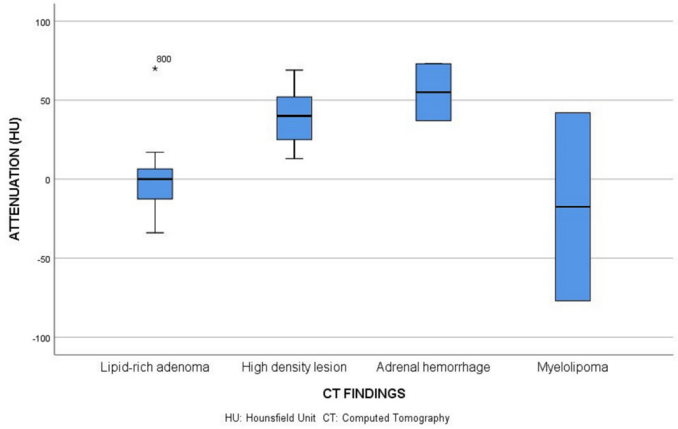

Figure 2. Attenuation distributions of incidentalomas on CT

The most common lesion localization was the left body, and the localizations of incidentaloma lesions are shown in Table 4.

Table 4. Localizations of lesions

	Adrenal incidentaloma	
	Unilateral n (%)	Bilateral n (%)
RB	18 (25.7)	7 (43.8)
LB	26 (37.1)	7 (43.8)
RML	2 (2.9)	1 (6.2)
LML	11 (15.7)	-
RLL	3 (4.3)	-
LLL	10 (14.3)	1 (6.2)
Total	70 (100)	16 (100)

RB: right body, LB: left body, RML: right medial limb, LML: left medial limb, RLL: right lateral limb, LLL: left lateral limb

DISCUSSION

The prevalence of adrenal incidentalomas can vary depending on the nature of the study, whether it is based on autopsy or radiological series, and whether the patients are drawn from the general population or specific cohorts (9). Increased frequency of imaging has led to a higher detection rate of incidental adrenal lesions, which is estimated to be around 4–6% in the population (10). The proportion of incidentally detected lesions is expected to rise with advancements in imaging technologies (11), thereby highlighting the crucial role of radiologists in diagnosing incidental adrenal lesions.

In our study, we observed a prevalence of 9.7% for adrenal incidentalomas. This finding aligns closely with the prevalence reported in autopsy series, some of which have reported rates as high as 9% (12). The relatively smaller sample size in our study may have contributed to a higher incidence of adrenal lesions, as the imaging was specifically focused on detecting adrenal abnormalities. Earlier studies conducted before 2000 have reported a relatively lower prevalence of incidental adrenal masses, approximately around 1% (13). However, with the

evolution and widespread use of imaging techniques, the prevalence of adrenal masses has shown a shift over time. By excluding patients with lung cancer metastasis from the study conducted by S. Bovio et al. (14), which is one of the studies used to estimate the prevalence of adrenal incidentaloma, the prevalence of adrenal lesions was found to be 4.2%. Another study by EV Ferreira et al. (15) reported a 2.5% prevalence of incidentalomas in the adrenal glands on CT imaging. Our study revealed a higher prevalence of 9.7% compared to previous studies. It is anticipated that the prevalence of adrenal incidentaloma on CT imaging will continue to increase with the advancement of high-resolution CT techniques.

Incidental tumors are frequently encountered in clinical practice, and their incidence tends to rise with age. Age has been shown to have a positive correlation with the occurrence of incidentalomas, suggesting that the incidence of these lesions increases as individuals get older (1). Studies by Bovio et al. (14) and Mantero et al. (16) have demonstrated that the prevalence of incidentalomas rises with age, and older patients are at a higher risk of developing adrenal tumors. Our findings align with these studies, as we also observed an increased incidence of incidental tumors with age, particularly after the age of 60. These results support the notion that age should be considered an important factor in the evaluation and monitoring of patients with adrenal incidentalomas.

Several studies have found no statistically significant difference in the frequency of adrenal incidentalomas between male and female patients (2,17). Our data support these findings since we found no significant difference in the frequency of adrenal incidentalomas between male and female individuals. This finding is consistent with previous research and supports the assumption that gender is not a significant risk factor for the development of adrenal incidentalomas.

Adrenal incidentalomas are commonly observed in imaging studies, typically exhibiting a mean diameter of 20 mm. This finding is in line with previous studies reporting mean diameters ranging from 15 mm to 30 mm. As in the literature, we observed that the diameter of the lesion and the prevalence of incidentaloma were slightly higher in men than in women in our study. However, this difference was not statistically significant.

The most frequently observed adrenal incidentaloma on non-contrast computed tomography (NCCT) is an adenoma, characterized by well-defined margins and a round or oval-shaped mass. The presence of calcifications or fat within the mass serves as a strong indicator of an adrenal adenoma. In rare cases, adrenal adenomas may exhibit increased attenuation values on NCCT, which could suggest a lipid-poor adenoma or malignant transformation (17,18). Our study confirmed the predominance of lipid-rich adenomas as the most common subtype of adrenal incidentaloma, consistent with existing literature (19). Additionally, we identified lesions demonstrating high density, adrenal hemorrhage, and imaging features characteristic of myelolipoma, aligning with established findings. However, due to the absence of contrast enhancement in our imaging protocol, additional imaging with an adrenal-specific CT protocol was required to evaluate non-fat adenomas.

Kulalı et al. investigated the prevalence of adrenal incidentaloma on CT scan in the geriatric population and found a high prevalence of 47.2% in this age group (20). In our own study, we found that the prevalence of incidentaloma increased as the age population increased, in accordance with this study. In addition, our study is the first current study in Turkey, covering all age categories.

It is important to acknowledge several limitations of our study. Being retrospective in nature, our study may have reported higher prevalence values compared to routine clinical practice, as CT images were reviewed specifically to identify adrenal lesions. Another limitation pertained to the diagnostic evaluation of lesions other than fat-rich adenomas, which necessitated the use of a CT protocol specific to the adrenal glands due to the absence of contrast enhancement in our imaging modality.

CONCLUSION

Adrenal incidentaloma have become more common radiological findings with the recent COVID-19 pandemic and the increased frequency of CT scans, and appropriate management of these patients is crucial . Radiologists and clinicians who properly interpret the results can spare these patients from needless tests and expenses.

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Conflict of Interest: *The authors declare that they have no competing interest.*

Ethical approval: *This study protocol received approval from both the local ethics committee of Trakya University School of Medicine (TUTF-BAEK 2020/295) and the COVID-19 Scientific Research Committee of the Republic of Turkey Ministry of Health.*

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