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Prevalence of adrenal incidentaloma in patients performed thorax computed tomography for suspected COVID-19 infection

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ABSTRACT

Aims: The primary purpose of this study is to make a retrospective evaluation of adrenal incidentaloma (AI) prevalence in patients performed thorax computed tomography (TCT), along with determining whether the diagnosed AIs were assessed functionally for adrenal gland hyperfunction and to detect the rate of hyperfunctional AI.

Methods: The patients who applied to with the suspected COVID-19 and performed TCT between January 2020 and December 2021, were included in the present study. However, the patients who were followed-up due to a known adrenal mass and a malignant tumor were excluded.

Results: TCT imaging, including adrenal glands, was performed on 2580 patients. The mean age for these patients was 54±16.8. However, when the patients were separated into groups in terms of adrenal pathology (AP), the mean age for the patients with and without AP was 61.4±11 and 53.8±16.9, respectively ($p<0.001$). The number of patients detected with AP, AI, and adrenal hyperplasia was 68 (2.6%), 60 (88.2%), and 7 (10.3%), respectively. The mean mass diameter was 17 (11-41). Bilateral adrenal hyperplasia was not observed in any patients; however, 13 of the patients (18.1%) detected with AI and adrenal hyperplasia were evaluated functionally. Hyperfunction was not observed in any of the assessed patients.

Conclusion: The prevalence of AI found in our study was similar to other studies in the literature; however, functional evaluations of AIs detected via TCT performed due to suspected COVID-19 remained low. Although they are rare, it is important to define whether AIs are functional or malignant due to the comorbid conditions they create. For this reason, we believe patients with AI should be directed to an endocrinology clinic for a practical examination and follow-up plan.

Keywords: Adrenal incidentaloma, adrenal hyperplasia, COVID-19, prevalence

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INTRODUCTION

Adrenal incidentaloma (AI) is defined as an adrenal mass larger than 10 mm detected by coincidence throughout radiological examination for reasons other than an adrenal disease.[1] Adrenal masses may be found incidentally when computed tomography (CT) scans or magnetic resonance imaging (MRI) are performed for other reasons. Nowadays, AI is more common due to the widespread use of imaging methods. Once these masses are detected, radiological and biochemical evaluations are required to determine the risks of malignancy and whether there is excessive hormone secretion or not. Nonetheless, most of the incidentalomas are not followed.[2] The prevalence of AI varies regarding data sources such as autopsy series-radiological series and patient selection such as general population-specific patient categories.[3] The prevalence of AI determined by imaging methods differs in various studies. While a study reported a 4.4% of prevalence for abdominal CT,[4] another study found the prevalence to be 0.98% for abdominal CT and 0.81% for thorax computed tomography (TCT).[4,5]

Over the course of the COVID-19 pandemic, which started in 2019 and influenced almost all the world, TCT was performed for the diagnostic and therapeutic purposes. The main aim of this study is to make a retrospective evaluation of AI prevalence in patients performed TCT due to suspected COVID-19 infection. The secondary reason behind this study is to determine whether the diagnosed AIs were assessed functionally for adrenal gland hyperfunction and to detect the rate of hyperfunctional AI.

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METHODS

The study was initiated with the approval of the Dışkapı Yıldırım Beyazıt Training and Research Hospital Non-interventional Clinical Researches Ethics Committee (Date: 19.04.2021, Decision No: 109/10). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The present study was designed retrospectively, and the patients having applied to due to suspected COVID-19 and performed TCT between January 2020 and December 2021 were involved. However, those who were followed up due to a known adrenal mass and a malignant tumor were excluded. AI was defined as adrenal masses larger than 1 cm discovered throughout the radiological examination for reasons other than investigating an adrenal disease 6. Adrenal hyperplasia was considered enlarged on the condition that the axis of the body of the adrenal gland was >10 mm or the diameter of a limb was >5 mm. The diagnosis of AI was based on TCT findings, and it was noted down whether the identified AIs were functionally evaluated. The radiology report of each TCT was reviewed, and the patients whose reports indicated an adrenal gland abnormality were also registered. The radiological images of the patients with a detected adrenal mass were assessed by a second specialist, and the reports were verified. The endocrinologic evaluation was made in the patients with AI regarding the guidelines: overnight 1-mg dexamethasone suppression test or 24-hour urine cortisol measurement for hypercortisolism, 24-hour urinalysis or plasma for catecholamines and metanephrines, and measurement of plasma renin activity and plasma aldosterone concentration for hypertension (HT) or hypokalemia.[1,6] The presence of HT and diabetes mellitus (DM) diagnosis was recorded based on the patients' files.

RESULTS

TCT imaging, including adrenal glands, was performed on 2876 patients with suspected COVID-19. The number of the patients involved in the present study considering inclusion criteria was 2580, and 1327 of them (51.4%) were female. The mean age was 54±16.8. The number of the patients with HT and type 2 DM was 662 (25.7%) and 423 (16.4%), respectively.

Once the patients were classified in terms of adrenal pathology (AP), the mean age for the patients with and without AP was 61.4±11 and 53.8±16.9, respectively (p<0.001). On the other hand, the number of female patients with and without AP was 43 (63.2%) and 1284 (51.1%), respectively. HT and DM frequency was measured in the patients with AP to be 14 (20.6%) and 18 (26.5%), whereas 648 (25.8%) and 405 (16.1%) in the patients without AP (p=0.399 and p=0.03, respectively). Additionally, 18 (4.2%) of the patients with DM had AP.

AP was detected in 68 (2.6%) patients. Sixty (88.2%) patients were with AI, and 7 (10.3%) were with adrenal hyperplasia. Angiomyolipoma was found in only 1 patient (1.5%) on TCT imaging. Forty-two (70%) of AIs were on the left, and 14 (23.3%) were on the right. However, in two cases, 4 (6.7%) were bilateral. The mean mass diameter was 17 (11-41). One (14.3%) of adrenal hyperplasias was on the right side, and 5 (71.4%) were on the left. Bilateral adrenal hyperplasia was observed in 1 (14.3%) patient. Thirteen (18.1%) of the patients with AP were evaluated functionally; however, no patient was functionally active among the assessed patients (**Table 1**).

Table. Characteristic of adrenal lesions (n=68)

Age, years	61.4 ± 11
Gender	
Female, n (%)	43 (63.2%)
Male, n (%)	25 (36.8%)
Findings	
Adrenal incidentaloma, n (%)	60 (88.2%)
Adrenal hyperplasia, n (%)	7 (10.3%)
Angiomyolipoma	1 (1.5%)
Adrenal mass size, mm	17 (11-41)
Adrenal incidentaloma	
Left, n (%)	42 (70%)
Right, n (%)	14 (23.3%)
Bilateral, n (%)	4 (6.7%)
Adrenal hyperplasia	
Right, n (%)	1 (14.3%)
Left, n (%)	5 (71.4%)
Bilateral, n (%)	1 (14.3%)

When the patients with AP were functionally evaluated, the mean age for those with functional evaluation was similar to those with no functional evaluation (59.5±7.6 and 61.3±11.6, p=0.605, respectively). Mass sizes were also similar (19.5 (11-33) and 17 (11-41), p= 0.492, respectively). There was no difference between both groups considering DM and HT rates (p=0.309 and p=0.955, respectively).

Statistical Analysis

Visual (histograms and probability plots) and analytic methods (Kolmogorov-Smirnov and Shapiro-Wilk's test) were used for the normally and non-normally distribution of the variables. Normally distributed variables were compared via the independent sample's T-test. The Chi-square test or Fisher's exact test (when Chi-square test assumptions do not hold due to low expected cell counts) was used to compare the proportions in patients with and without AP. The continuity correction was used on the condition that the expected count was from 5 to 25. Median and minimum-maximum presented descriptive analyses for non-normally distributed variables and numbers and percentages for categorical variables. A p-value less than 0.05 was considered statistically significant.

DISCUSSION

In our study, we found the rate of AI to be 2.6% in patients performed TCT with suspected COVID-19 infection. This rate is consistent with other studies in the literature. As expected, patients with AI had a higher mean age. The number of patients with functional evaluation was minimal, and hyperfunction was not observed in any of them.

Factors such as technologically advanced diagnostic imaging, the aging population, and the awareness of preventive maintenance have led to a substantial increase in the number of AP diagnosis.[7] In a study conducted in 1982,[8] the prevalence of CT and AI was detected to be 0.6%. However, the studies revealed a higher AI rate in the following years. On the other hand, some recent studies have provided similar results to our research. Taya et al.[9] indicated a 2.3% AI rate in their study conducted on 42,575 abdominal CT, whereas this rate was found to be 2.1% in another study.[9,10] In addition to the studies mentioned above, there are various studies detecting higher AI prevalences, which were found to be 4.4% and 5.1%.[11]

The reason for these differences in a study may be the inclusion of elderly patients screened for lung cancer or the combined evaluation of abdominal and TCT scans, not just the thorax.[4,11] A large study 12 encompassing all hospitals in West Sweden reported that the AI frequency was only 0.9% at the initial radiological evaluation, then increased to 4.5% after the central radiological revision. The difference is particularly striking in TCT evaluations. In addition, another reason may be the assessment of TCT in patients of all ages with suspected COVID-19 infection. Considering autopsy series, in a study analysing the world literature on the prevalence of AI, the median value for all research was found to be 3%, close to our study.[7]

The prevalence of AI increases with age and reaches the highest rate between the 5th and 7th decades.[7] As stated previously, when the patients were separated into groups regarding AI, the mean age for the patients with AI was found to be higher as expected. On the other hand, we did not detect any difference between the patients in regards to gender factor. However, a wide range of research indicates that the prevalence of AI in females is higher than in males, which has not been observed in autopsy studies.[7,12-14] Nevertheless, some studies show that gender distribution is almost equal, similar to our research.[11] Another finding of our study was that the HT rate was the same in patients with and without AI, whereas the DM rate was high. The reason behind this finding may be that the mean age for the patients with AI was found to be higher. Nonetheless, in studies evaluating similar mean age, the DM rate was higher in patients with AP, like our study.[15]

The size and lateralization of AI have been investigated in many previous studies. In our study, the mean mass diameter was 17 mm. In a recent study16 that screened 1149 patients, the mean tumor size was 18 mm. In another recent study,[17] the mean tumor size was found to be 17 mm, similar to our study. Interestingly enough, in a study conducted in our country, the tumor diameter was found to be 48 mm.[18] This difference may be related to the study population or the number of patients.

Our study detected 70% of AIs on the left and 23.3% on the right. Bilateral AI was present in 6.7% of the cases. Similar lesion distribution in the right and left adrenal glands was reported in autopsy studies and CT series.[7] However, some studies provide a higher prevalence of left-sided adrenal tumors detected on imaging.[17,19] This observation may reflect a detection bias, as left-sided adrenal tumors are more easily observed by radiologists.[7]

We did not detect any difference among the patients with AP in terms of age, tumor size, and the rate of comorbidities (DM and HT). In a study conducted by Maher et al.[10] the patients with AI were compared based on their follow-up conditions. In discordance with our research, the age average was found to be low, whereas the tumor size was found to be larger in those patients who were followed up.

Many AIs were non-hyperfunctioning; only 10-15% of hyperfunctioning were reported.[13,20] A review presented that 89.7%, 6.4%, 3.1%, and 0.6% of the AIs were non-functioning, subclinical Cushing's syndrome, pheochromocytoma, and primary aldosteronism, respectively. Hyperfunction was not detected in any of the 13 patients examined by endocrinologists in our research. On the other hand, a study in Türkiye 21 conducted on 376 patients with AI revealed that 10.9%, 4%, 5.3%, and 4% of the patients were detected with subclinical Cushing's syndrome, Cushing's syndrome, pheochromocytoma, and primary hyperaldosteronism, respectively. The point to be noted here is that all of these patients were evaluated by endocrinologists. In the study by Davenport et al.[22] AI was detected in 75 out of 4028 patients on their abdominal CT scans. It was determined that only 13 (17%) of the patients with AI were referred for specialist review. Eighty percent of AI patients were not evaluated biochemically and followed up. However, all of the patients referred to an endocrinologist were evaluated appropriately, and adrenalectomy was indicated for 3 of these patients. Accordingly, in our study, only 13 (18.1%) patients were referred for endocrinological evaluation.

CONCLUSION

Considering the aforementioned studies, the prevalence of AI was detected between 0.3% and 5.1%. When analyzing the studies evaluating AI prevalence through only TCT, it differs between 0.81% and 4.4%; however, it was found to be 2.6% in our research. Even though our findings were similar to the results of other studies in the literature, the rate of functionally evaluated AIs detected via TCT due to suspected COVID-19 remains low. Although they are rare, it is important to define whether AIs are functional or malignant due to the comorbid conditions they create. In this regard, we consider that patients with AI should be directed to an endocrinology clinic for a practical examination and follow-up plan.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was initiated with the approval of the Dışkapı Yıldırım Beyazıt Training and Research Hospital Non-interventional Clinical Researches Ethics Committee (Date: 19.04.2021, Decision No: 109/10).

Informed consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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