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Incidental findings in chest computed tomography of patients with thoracic trauma: what we need to know

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Abstract. – OBJECTIVE: This study emphasizes the importance of appropriately evaluating incidental findings (IF) detected in chest computed tomography (CCTs) of patients with trauma and provides related guidance and information.

PATIENTS AND METHODS: All patients aged ≥ 18 years who were admitted to the emergency department and underwent CCT for thoracic trauma were retrospectively screened, and 567 patients were included in the study. The findings were divided into five groups: those requiring immediate intervention, clinical evaluation, additional examination, and control examination after follow-up and those not requiring follow-up. Additionally, to evaluate the emergency reporting of these pathologies, the CCT reports were evaluated to reveal the IF rate.

RESULTS: The mean age of the 567 patients was 47.96 ± 19.38 years (18-102 years); of which, 372 (65.6%) were male and 195 (34.4%) were female. At least one IF was observed in 261 (46%) patients. The lungs of 81 (13.6%) patients exhibited the highest rate of IFs. No difference was observed between males and females in terms of the presence of at least one IF ($p = 0.144$). The mean age of the patients with IF was significantly higher than that of those without IF ($p < 0.001$). Of the 294 patients whose CCT was presented in an emergency report by a radiologist, 142 (48.6%) had at least one IF; however, no IF was mentioned in the reports of 77 patients (54.5%).

CONCLUSIONS: IFs should be properly reported according to their severity and included in patient records, consequently facilitating early treatment or additional examinations and eliminating the need for performing repeated examinations for those not requiring follow-up.

Key Words:
Chest CT, Incidental findings, Radiologists, Trauma.

Abbreviations

CCT: Chest computed tomography; CT: Computed tomography; NAFLD: Non-alcoholic fatty liver disease; NCPN: Noncalcified pulmonary nodule; MLAP; Mediastinal lymphadenopathy; COVID-19: Coronavirus disease 2019; PET: Positron emission tomography; MRI: Magnetic resonance imaging; HS: Hepatic steatosis.

Introduction

As imaging methods, such as computed tomography (CT) have become increasingly accessible in emergency departments, the rate of incidental findings (IF) detected in these examinations has also increased[1]. Since IFs are often overlooked, it is important to decide whether such findings are critical to ensure the appropriate provision of guidance to physicians and patients in such cases.

Chest CT (CCT) of patients admitted to the emergency department for thoracic trauma might reveal that IFs are not associated with the trauma but could be potentially critical for the patients. These findings include pulmonary nodules, thyroid nodules, lymphadenopathies, adrenal adenomas, biliary calculi, cholecystitis, and malignancies. In the presence of emergency traumas, such findings are often ignored. Early IF diagnosis increases the chances of patient survival and reduces morbidity[2]. However, overdiagnosis can lead to unnecessary diagnostic examinations[3]. In case of a potentially critical IF, it is essential to inform patients or their relatives to proceed with the necessary approach or follow-up and include the corresponding IF in the patient file[4,5]. Detecting an IF that might require intervention, close follow-up, and additional examinations and then reporting it as necessary, then the attention and follow-up of the physician in charge to the patient, would remarkably contribute to patient management in later stages and have a positive impact on the healthcare economy.

This study investigated IFs detected in patients with trauma who underwent CCT at the emergency department and evaluated these IFs in terms of

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their detection rate, correlation with age and sex, and their clinical significance and inclusion in CT reports. Hence, this study intends to reiterate the importance of appropriate evaluation of IFs by radiologists and bring the relevant health team's attention toward such instances to ensure the provision of appropriate guidance to the patients.

Patients and Methods

Using the G*power 3.1 program, the minimum sample size was found to be 567 with an effect size of 0.15, margin of error of 0.05, confidence interval of 0.95, and sample representation power of 0.95.

The patients aged ≥ 18 years who were admitted to the emergency department and underwent CCT for thoracic trauma between August 1, 2021 and October 30, 2021 were retrospectively screened. Overall, 567 patients met the inclusion criteria and were included in the study. Noncontrast CT examinations were conducted using Philips Medical System MX-128-slice multidetector (Koninklijke Philips N.V., Eindhoven, the Netherlands) device at 120 kV, 250 mA, and with a section thickness of 5 mm. The images were readily transferred to the picture archiving and communication system and evaluated on the workstation. In addition to the demographic data that included age and sex, each patient's CT images were evaluated for the presence of both trauma- and nontrauma-related pathologies accompanying the trauma. These findings were divided into five groups: those potentially requiring immediate intervention; those requiring clinical evaluation, additional examination, and control examination after follow-up; and those not requiring follow-up. Although the presence of an accessory spleen, vascular calcifications, and degenerative changes in bones are considered as IFs, they were not included in this study. Each IF was investigated in terms of its detection frequency by localization, sex, and age group. The IFs were also assessed in terms of their status of reporting in emergency conditions and inclusion in CT reports.

Statistical Analysis

The study data was analyzed using the IBM SPSS Statistics for Windows 26 (IBM Corp., Armonk, NY, USA) program. Categorical data were summarized as mean values and percentages. A p-value < 0.05 was considered statistically significant, and the p-values were calculated using Chi-square and t-tests.

Results

The 567 patients included in this study had a mean age of 47.96 ± 19.38 years (18-102 years), and 372 (65.6%) patients were male and 195 (34.4%) were female.

In the CT examinations performed for the patients with trauma, 503 (88.7%) showed no signs of trauma, whereas the remaining 64 patients (11.3%) showed signs of trauma. The most common findings were fractures and hemorrhages, which was observed in 43 (7.6%) and 27 (4.8%) patients, respectively.

Among the 567 patients, at least one nontrauma-related IF was observed in 261 patients (46%). One IF was observed in 169 patients (29.8%), two IFs were observed in 55 patients (9.7%), and at least three IFs were observed in 37 patients (6.5%).

The highest rate of IFs was observed in the lungs, with a total of 81 patients (13.6%) displaying IF in the lungs. The thyroid gland, in addition to the lungs, had a higher incidence rate of IF. Thyroid nodules or an enlarged heterogeneous gland was detected in 49 patients (8.6%).

Pulmonary nodules were observed in 42 patients (7.4%), at least one renal cyst was observed in 40 patients (7.1%), hepatic steatosis (HS) was observed in 23 patients (4.1%), and infection-related findings were observed in 19 patients (3.4%). Other common findings included liver pathology in 16 patients (2.8%), biliary calculi in 16 patients (2.8%), breast lesions in 12 patients (2.1%), renal calculi in 9 patients (1.6%), and adrenal gland lesions in 7 patients (1.2%). The rates of IFs are presented in Table I.

Of the patients in whom IFs were detected, 37.5% (98) were females and 62.5% (163) were males. Of the female and male patients with IFs, 50.2% and 43.8%, respectively, had at least one IF. However, regarding the presence of at least one IF, no difference in terms of sex was observed ($p = 0.144$). The patients with at least one IF had a mean age of 55.30 ± 19.76 years, whereas the patients without IFs had a mean age of 41.68 ± 16.70 years. The patients with IF had significantly higher mean ages than those without IF ($p < 0.001$).

Among the female patients, thyroid pathology was the most common IF, which was present in 32 patients (32.7%). The second most common IF was in the lungs (29.6%). Of the male patients, 17 (10.4%) had thyroid pathology. In terms of the presence of thyroid nodules, a significant difference was observed between the male and female

Table I. Common incidental findings observed in chest computed tomography.

Incidental Findings	Present		Absent	
	n	%	n	%
Thyroid pathology	49	8.6	518	91.4
Gynecomastia	45	7.9	522	92.1
Pulmonary nodule	42	7.1	525	92.9
Renal cyst	40	5.3	527	94.7
Hepatic steatosis	23	4.1	544	95.9
Infection of the lung	19	3.4	548	96.6
Gallstone	16	2.8	551	97.2
Liver pathology	16	2.8	552	97.2
Breast pathology	12	2.1	555	97.9
Renal calculus	9	1.6	558	98.4
Adrenal lesion	7	1.2	560	98.8
Others	111	19.6	456	80.4

n: number of patients.

patients ($p < 0.001$). The patients with thyroid pathology had a significantly higher mean age ($p < 0.001$).

In male patients, gynecomastia was the second most common IF detected (7.9%), with 45 (12.1%) out of the 372 male patients showing gynecomastia.

Renal cyst was observed in 25 (15.3%) male patients and 15 (15.3%) female patients, with no difference between males and females in terms of renal cyst presence ($p = 0.995$). The patients with renal cysts had a higher mean age ($p < 0.001$).

Pulmonary nodules were found in 19 (11.7%) male patients and 23 (23.5%) female patients, and no significant difference was observed between males and females in terms of pulmonary nodule presence ($p = 0.013$). The patients with pulmonary nodules had a higher mean age ($p < 0.001$).

Of the seven patients with adrenal lesions, two (1.2%) were male and five (5.1%) were female, and there was no significant difference between males and females in terms of the incidence rate of adrenal lesions ($p = 0.065$).

Of the 16 liver pathologies other than HS, 12 (7.4%) were present in male patients and 4 (4.1%) in female patients, with no significant differences between males and females in terms of liver pathology incidence rates ($p = 0.271$).

HS was observed in 17 (10.4%) male patients and 6 (6.1%) female patients, and the incidence rates did not differ significantly by sex ($p = 0.223$) and mean age ($p = 0.719$).

Of the 12 patients with breast lesions, only 1 (0.6%) was male ($p < 0.001$).

Of the 19 patients with infections, 12 (7.4%) were male and 7 (7.1%) were female, with no significant difference between males and females in terms of the incidence rate of infections ($p = 0.947$).

The incidence rates of the common IFs by sex are presented in Table II.

Of the 567 patients who underwent CT examinations, the CT report of 294 patients (51.9%) were submitted by a radiologist before the patient was discharged from the emergency department. Of these 294 patients, at least a single IF was detected in 142 patients (48.6%). In 77 of the 142 patients with IF, the CT reports had no mention of IFs (54.2%). Partial findings were mentioned in 23 patients (16.2%) and complete findings were reported for 42 patients (29.6%, Table III).

Considering the 273 patients for whom no consultation was conducted for obtaining a radiologist's opinion, it is understood that of the 261 patients with IF, these findings were reported completely in 16.1% of the patients and partially in 8.8% of the patients.

When the groups determined according to the clinical importance of IFs are evaluated, 16 patients (2.8%) had IFs that potentially required immediate intervention, 157 (27.7%) had IFs that primarily required clinical evaluation, 66 (11.6%) had IFs that required additional examination, 19 (3.4%) had IFs that required control examination during follow-up, and 91 (16%) had IFs that did not require follow-up (Table IV).

A CT report was requested for 43.8% of the 16 patients who were diagnosed with IFs that potentially required emergency treatment, and the findings were included in their reports.

Of the 157 patients with IFs that were considered to require primary clinical evaluation, 56.1%

Table II. Detection rates of some common incidental findings according to gender.

Incidental Findings			Male	Female	Test Value	*p*-value
Thyroid pathology	**Absent**	n	146	66	19.256	<0.001
		%	89.6%	67.3%		
	Present	n	17	32		
		%	10.4%	32.7%		
Gynecomastia	**Absent**	n	118	98	47.878	<0.001
		%	72.4%	100.0%		
	Present	n	45	0		
		%	27.6%	0.0%		
Pulmonary nodule	**Absent**	n	144	75	6.137	0.013
		%	88.3%	76.5%		
	Present	n	19	23		
		%	11.7%	23.5%		
Renal cyst	**Absent**	n	138	83	0.000	0.995
		%	84.7%	84.7%		
	Present	n	25	15		
		%	15.3%	15.3%		
Hepatic steatosis	**Absent**	n	146	92	1.482	0.223
		%	89.6%	93.9%		
	Present	n	17	6		
		%	10.4%	6.1%		
Infection of the lung	**Absent**	n	151	91	0.004	0.947
		%	92.6%	92.9%		
	Present	n	12	7		
		%	7.4%	7.1%		
Breast pathology	**Absent**	n	162	87	16.337	<0.001
		%	99.4%	88.8%		
	Present	n	1	11		
		%	0.6%	11.2%		
Adrenal lesion	**Absent**	n	161	93	3.398	0.065
		%	98.8%	94.9%		
	Present	n	2	5		
		%	1.2%	5.1%		

n: number of patients.

of these had CT reports and 39.8% of these had at least one IF included in their CT reports.

Of the 66 patients with IFs requiring additional examination, 57.6% had CT reports and 42.1% had at least one IF included in their CT reports.

A CT report was requested for 42.1% of the 19 patients who were found to have IFs requiring control examination during follow-up, and 62.5% of these IFs were mentioned in the reports. In the 91 patients with IFs who did not require follow-up, the rate of CT reporting was 53.8%, and mention of the IFs in CT reports was 67.4%.

Discussion

Although an IF detected during imaging performed for patients with trauma might not seem urgent at that time, it can exert negative effects on patients' health and even have legal consequences for the doctors if it is overlooked. Since these findings are not usually clearly and appropriately documented in patient records, they lead to inappropriate follow-ups and referrals[1]. Furthermore, it can have negative impacts on hospital stay duration and healthcare costs of the patient[2,4]. Despite such problems associated with IFs, they are continued to be overlooked in clinical settings.

In previous studies on whole-body CT scans of trauma patients, 43%-53% of the IFs were included in CT reports and 29%-59% of these reported IFs were found to require follow-up[3,6-8]. In this study, which retrospectively investigated a group of patients undergoing CCT for thoracic trauma, 46% of the patients were found to have at least one IF. Furthermore, when evaluating all the patients in terms of IFs of varying levels of clinical criticality, 2.8% were found to have IFs that potentially required im-

Table III. Status of mentioning IFs in written CT reports.

		n	%
The reporting status of the CTs before the patient is discharged from the emergency room	**Absent**	273	48.1
	Present	294	51.9
Presence of IFs on CTs that have been reported	**IF absent**	152	51.7
	IF present	142	48.3
Status of mentioning IFs in reported CTs that show the presence of IF	**IF mentioned in the report**	42	29.6
	IF not mentioned in the report	77	54.2
	Some of the IFs mentioned in the report	23	16.2

CT: computed tomography, IF: incidental finding, n: number of patients.

mediate intervention; 42.7% had IFs that required clinical evaluation, additional examination, or control examination during follow-up; and 16% had IFs that did not require follow-up.

Some studies[7-9] have indicated that IFs are more frequently identified in the abdomen and are more common in older patients. In another study, it was reported that the distribution of IFs did not differ depending on body regions or tissue types[6]. Due to the nature of the current study, the lungs, kidneys, and thyroid glands were the organs with the highest incidence rates of IF. Although the incidence rate of IFs was found to increase with age, there was no difference between males and females in terms of the presence of at least one IF. However, some studies[8,9] reported IFs to be more common in female patients and, by contrast, other studies[10] have stated that there is no association between sex and the rate of IFs, which was also demonstrated in this study.

In case of the detecting of a potentially critical IF, it is important to keep patients or their relatives informed regarding the proceedings of the necessary approach or follow-up as well as to include the respective IF in the patient file[4,5]. In our study, 2.8% of the patients had IFs that potentially required emergency treatment before discharge. Most of these IFs were findings highly consistent with viral pneumonia (11 patients, Figure 1). Five patients had possible signs of bacterial pneumonia. In addition, two patients who were already being followed up showed symptoms of resolved viral pneumonia. In fact, it is necessary to consider the possibility of viral pneumonia in every CCT during the pandemic. In a retrospective study, Neveu et al[11] encountered CT findings that strongly suggested coronavirus disease 2019 (COVID-19)-related pneumonia in 3% of patients who were finally diagnosed with COVID-19 via RT-PCR. In this study, the findings strongly suggesting viral pneumonia accounted for 2.3% of all the CT findings. For 43.8% of patients with pneumonia symptoms that potentially required emergency treatment, CT reports had been submitted before the patients were discharged from the emergency department.

In addition to numerous IFs that are potentially critical for maintaining patient health, IFs that do not require follow-up also exist. In the presence of such IFs, which have no clinical importance, patients and their relatives may be directed to unnecessary follow-up and further imaging. Therefore, the clinical severity of these findings and their effect on the patient's health should be considered before taking an action regarding future steps. The early diagnosis of IF has been shown to increase the survival of the patients and reduce morbidity[2]. However, overdiagnosis can also lead to unnecessary diagnostic examinations[3]. Shetty et al[12] biopsied the thyroid nodules detected as IFs in CT scans and found 22% of them to be malignant. Furthermore, it was reported that 29% of the incidentally detected adrenal masses with a diameter of >3 cm were malignant[5,13]. In addition to the IFs that might require immediate intervention, IFs requiring clinical evaluation (27.7%), additional examination (11.6%), or control examination after follow-up (3.4%) were detected in this study. The findings detected in these patients were pulmonary nodules, thyroid nodules, renal cysts, HS as well as liver, breast, and adrenal lesions.

Table IV. Distribution of patients with incidental findings by clinical significance.

Incidental Findings	n	%
Requiring emergency treatment	16	2.8
Requiring clinical evaluation	157	27.7
Requiring additional examination	66	11.6
Requiring control examination after follow-up	19	3.4
Not requiring follow-up	91	16.0

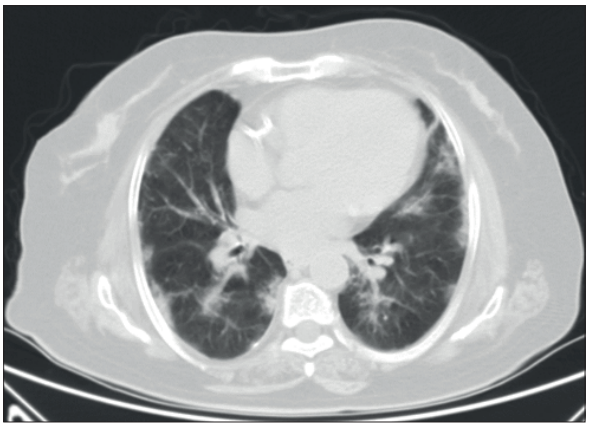

Figure 1. Peripheral patchy infiltrates most likely consistent with viral pneumonia in a 79-year-old female patient.

The widespread use of multidetector CT for thoracic imaging has led to a significant increase in the number of pulmonary nodules detected incidentally[14]. In a retrospective study, Gould et al[15] scanned patients with nodules of size 4–30 mm and found incidental lung nodules in 29% of all the CCT examinations. In another study, pulmonary nodules were detected in 13.9% of 2479 patients with coronary CT angiography[16]. In this study, pulmonary nodules with diameters of 4-11 mm were detected in 7.1% of the patients. The most common localization of nodules was in the upper (28%) and lower (13.3%) left lobes.

Solitary, noncalcified pulmonary nodules (NCPNs) with a diameter of <6 mm generally do not require routine follow-up since little direct evidence exists that alludes to the possibility of cancer in the low-risk group; however, in the presence of high-risk factors, they may require follow-up with control CT in the 12th month[17]. In this study, 13 patients (2.3%) with NCPNs having a diameter of <6 mm were included in the group that required clinical evaluation to investigate their risk factors.

Low- and high-risk patients with solitary NCPNs with diameters of 6–8 mm are primarily recommended to undergo control CT within 6–12 months and those with solitary NCPNs with diameters of ≥8 mm are recommended to undergo CT or positron emission tomography (PET)/CT in the 3rd month[17]. In this study, 11 patients (1.9%) having NCPNs with a diameter of 6–8 mm and one patient (0.2%) with a NCPN of >8 mm in diameter were observed (Figure 2).

High-risk patients with multiple NCPNs of diameters <6 mm and patients with multiple NCPNs with diameters of ≥6 mm are recommended to undergo control CT primarily in 3-6 months[17]. In the current study, there were two patients in the group with a nodule diameter < 6 mm, whereas two patients with nodules of ≥6 mm required a control examination during the follow-up period.

For subsolid nodules, if the diameter is <6 mm, it does not require routine follow-up and if it is ≥6 mm or there are multiple nodules, control CT examination is needed within a period of 3-12 months depending on its structure[17]. In this study, four patients, including one with multiple ground-glass density nodules and three with solitary ground-glass density nodules, required control CT during the follow-up period.

The differential diagnostic evaluations of a pulmonary calcified lesion may include calcified granuloma, hamartoma, osteosarcoma, chondrosarcoma, and lung metastases[18]. In this study, since pulmonary nodules cannot be fully characterized due to the partial volume effect caused by section thickness and since the risk factors of the patients are not known, all the eight patients with calcified nodules were included in the group that required clinical evaluation. However, it should be noted that some of these patients might not require routine follow-up after clinical evaluation.

In the previous studies, incidental thyroid nodules, reported to be present in 25% of CT examinations, are defined in different proportions with varying modalities[19,20]. In this study, thyroid nodules or an enlarged heterogeneous thyroid gland was detected in 8.6% of the 567 patients who underwent CCT. In relation to the solitary thyroid nodules that were incidentally detected via CT and magnetic resonance imaging (MRI), patients aged < 35 years who have nodules of diameters ≥ 1 cm or those aged ≥ 35 years who have nodules of diameters ≥ 1.5 cm were recommended to un-

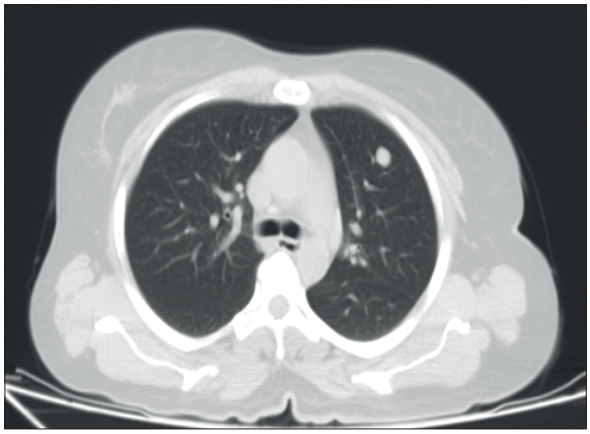

Figure 2. Solitary NCPN with a diameter of 10 mm in the left upper lobe of the lung of a 47-year-old female patient.

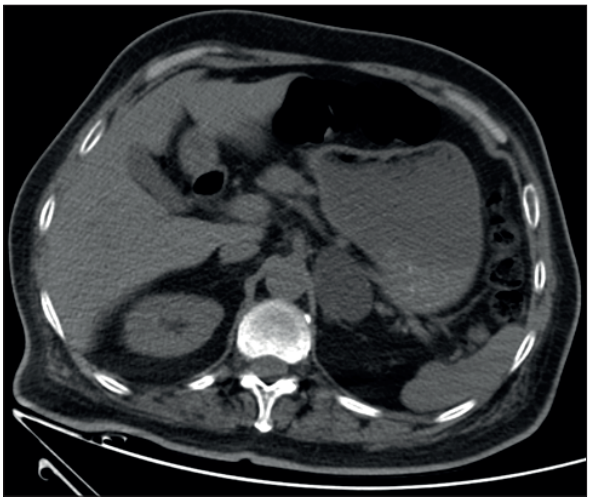

Figure 3. A surrenal lesion of approximately 4 cm × 3 cm in a 68-year-old male patient.

dergo further ultrasound examination[21]. Furthermore, for patients with enlarged heterogeneous thyroid glands, additional ultrasound examination was recommended[21]. In this study, thyroid nodules or heterogeneous thyroid gland enlargement was detected in 8.6% of the patients. Of the 5 patients aged < 35 years, 4 had solitary nodules, and of the 44 patients aged ≥ 35 years, 34 had solitary thyroid nodules. Overall, in this study, the total number of patients with heterogeneously enlarged thyroid glands was 11. Because of the absence of any suspicious findings, the number of solitary nodules that did not require additional examination was six and were detected in patients aged > 35 years.

Adrenal incidentaloma is detected in approximately 3%–4% of abdominal CT and MRI examinations[22]. In this study, out of the 567 patients included, the proportion of patients with adrenal lesions detected via CCT was 1.2%. Incidental adrenal masses are usually adenomas, and others types include cysts, hemorrhages, pheochromocytomas, metastases, and adrenocortical carcinomas[23]. Lesions other than cysts and adrenal hemorrhage cannot be easily characterized without using more specific imaging techniques[23]. While a lesion having at least a 1-cm diameter is considered sufficiently large to warrant further imaging examinations, no data exist that can be referred to for confirming the accuracy of imaging for masses with diameters of <1 cm[24]. In this study, seven patients had adrenal lesions of >1 cm in diameter, whose characteristics on noncontrast CT primarily suggested adenoma and which were decided to be appropriate candidates for differential diagnosis involving further examination (Figure 3).

It is imperative to describe breast lesions that are incidentally detected via CT as benign or suspicious. Irregular contours or formations are the features that most frequently predict malignance[25]. Meller et al[26] detected breast masses in 12 of the 1208 women over the age of 21 years who underwent whole-body CT, and after a detailed evaluation, 50% of the women with breast masses were diagnosed as having breast cancer. In a case series, Moyle et al[27] showed that approximately 30% of the incidentally detected breast lesions were irregular masses. In our study, we detected breast lesions in 5.6% of the female patients. Three of these patients had asymmetrical parenchymal density, eight had nodular lesions with well-defined margins, and two had lesions with ill-defined margins. In addition, a male patient had unilateral nodular lesion with ill-defined margins, which was suspected to be malignant (Figure 4).

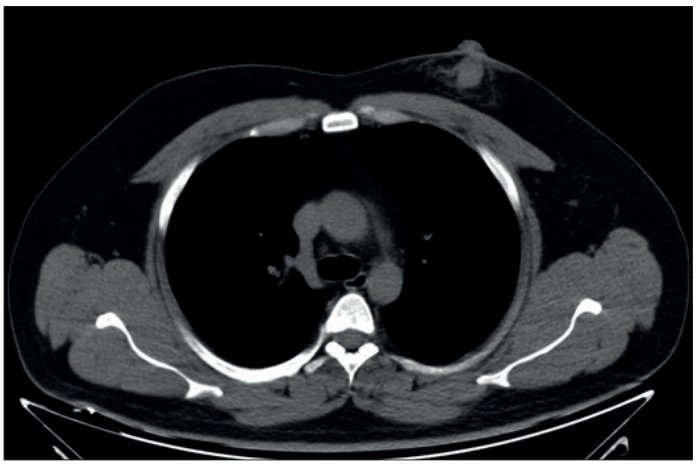

Figure 4. A 34-year-old male patient with a suspected malignant lesion of approximately 2 cm in diameter in the retroareolar area of the left breast.

In a study on patients undergoing CT, 32.3% of 1877 patients were reported to have gynecomastia[28], whereas another study reported CT-detected gynecomastia in 25.6% of 82 patients[29]. Gynecomastia was detected in 12.1% of the 372 male patients in this study. In general, if the examinations do not reveal a critical underlying pathology, routine follow-up is recommended after a 6-month interval[30]. In this study, the clinical information of 45 male patients who had glandular tissue of ≥2 cm in diameter detected at the level of the nipple and were diagnosed with gynecomastia was not available in the hospital's information system. Considering the etiological possibilities, the patients with gynecomastia were included in the group of patients who required clinical evaluation. However, it is important to note that a significant number of patients would most likely be excluded from the follow-up list after undergoing clinical evaluation. The fact that none of the CT reports in the current study mentioned gynecomastia is a strong indicator proving that such findings are being grossly overlooked.

Simple kidney cysts are especially common in abdominal CT scans[31]. Cysts can be seen in up to 40% of patients who undergo CT[32]. The prevalence of cysts is directly proportion to age[33]. Small, unidentifiable cysts and homogeneous, thin-wall Bosniak type 1 and 2 cysts of low density, which are incidentally detected *via* noncontrast CT, have been reported to not require further examination, whereas those identified as having complex features, such as the presence of thick walls, septa, or hemorrhage require additional examinations[34,35]. In this study, renal cysts of Bosniak type 1 and 2 were detected in 7.1% of the patients. No significant findings were found indicating the presence of malignance in the patients. While no difference was found between the male and female patients in terms of renal cyst presence, the incidence rate of renal cysts increased in direct proportion to age. In general, it has been reported that the size of the cystic renal mass does not predict its malignance[36]. While the vast majority of cysts do not require any intervention or follow-up, if they are large enough to exert a mass effect on another organ, aspiration and sclerotherapy or laparoscopic surgery can often be performed[37,38]. Two patients with cysts of 71 mm and 117 mm in diameter showed compression of the surrounding tissue; therefore, these patients required clinical evaluation since they were thought to be potentially symptomatic.

In some reports, incidental liver lesions have been reported in up to 33% of radiological studies[39,40]. In this study, liver pathologies accounted for 6.9% and the liver lesions detected accounted for 2.5%. A number of recommendations have been made regarding the management of liver lesions incidentally detected via CT. Follow-up is not recommended for low-risk patients who have lesions with 1-cm diameters and for those who have benign lesions having >1-cm diameters[41]. In this study, the incidental lesions observed in the liver were <1 cm in diameter in two patients; however, since the risk factors of the patients were unknown, they were included in the group of patients requiring clinical evaluation. Four lesions > 1 cm in diameter did not require follow-up since they had benign features, such as low homogeneous densities, well-defined margins, and thin walls. There was another group of five lesions that required additional examination as they presented with suspicious features. In addition, two other patients showed signs of chronic liver disease and were already being followed up.

Non-alcoholic fatty liver disease (NAFLD) is a chronic liver disease that can progress into cirrhosis and hepatocellular carcinoma[42]. A meta-analysis estimated that the overall global prevalence of NAFLD diagnosed by imaging is approximately 25%[43]. Liver parenchymal densities of <40 HU or those 10 HU lower than the density of the spleen is a warning sign that indicates steatosis[44,45]. In this study, 23 patients with a hypodense appearance of diffuse liver required clinical evaluation for the above-mentioned reasons.

Even the inclusion of the detected biliary or renal calculi in CT reports helps both the patient and medical team in cases where the patient becomes symptomatic afterward[8]. In the current study, the proportion of patients with gallstones that we recommended to undergo clinical evaluation for their potential symptoms was 2.8%, whereas the proportion of those patients with kidney stones who were recommended the same was 1.6% of the whole patient group.

Incidental abnormalities of the pleura are usually pleural effusions, followed by noncalcified or calcified plaques[46]. In this study, 1% of the patients had pleural effusion. Three patients had accompanying signs of pneumonia, whereas three other patients had accompanying signs of heart failure. Pleural plaques, on the other hand, are usually benign and do not require treatment or follow-up but can sometimes relocate as noted via intermittent imaging[47]. Mazzei et al[46] detected pleural plaque in 5.1% of the 1482 patients who underwent CCT. In our study, this rate was 1.4% of 567 patients.

Incidentally detected mediastinal lymphadenopathy (MLAP) often requires further diagnostic procedures. A study reported that reactive inflammatory origin was present in multiple slightly enlarged mediastinal lymph nodes that were incidentally detected and also recommended extremely aggressive diagnostic approaches only for patients with known malignancies or a history of malignity[48]. However, it has also been reported that noncalcified MLAP is associated with an increased chance of lung cancer, advanced disease, and increased mortality in low-dose screenings for lung cancer[49]. In incidentally detected MLAPs, clinical consultation and/or CT/PET were recommended if the short axis diameter was >15 mm and there was no obvious signs of disease[50]. In this study, noncalcified MLAP was detected in three patients and only one of them had a short axis of over 15 mm in diameter and required further examination. The short axis was over 1 cm in diameter for the other cases of MLAP and was accompanied by pneumonia in one patient. Calcified MLAPs can be detected in cases such as tuberculosis, sarcoidosis, amyloidosis, and metastasis[51]. The number of patients who were found to have calcified MLAP with a short diameter of over 1 cm, and consequently recommended for a clinical evaluation was seven (1.2%).

In the current study, any incidental findings related to the pancreas was not detected. Some studies have mostly focused on incidental pancreatic cystic lesions, and they were reported in 1.2%–2.6% of abdominal multidetector CT examinations[52].

As seen in previous studies, the rate of IFs that are reported and followed up is quite low[4,7,53]. James et al[54] reported that only 1.4% of patients of trauma with detected IFs had their findings documented when they were discharged from the hospital. In this study consisting of 567 patients, IF was reported in 45.5% of 261 patients, albeit partially.

The abovementioned information clearly demonstrates the importance of indicting the degree of severity while reporting an IF and, if necessary, providing evidence-based guidelines for further evaluation or follow-up of the reported IF. Additionally, some recommendations presented herein are as follows: doctors requesting the imaging examiner to improve their abilities of evaluating and interpreting the images; the examinations being interpreted by multiple physicians, including radiologists; and systemic measures being taken to ensure that radiology reports are read thoroughly[1]. Treskes et al[6] further predicted that noting any potentially critical IF separately and in detail in the conclusion part of the CT report and communicating them to clinicians could be of great use for clinicians. In addition, a scoring or classification system has been reported in some studies in the literature wherein IFs are listed according to their clinical importance[2,5,8].

The present study has some limitations. This is a retrospective study; hence, different results can be obtained because of the differences in our patient population as well as depending on various risk factors.

Conclusions

The rate of potentially critical IFs detected via CCTs performed for patients with thoracic traumas has been increasing since the sections in such CCTs cover a variety of different tissue types. For this reason, imaging should be performed appropriately, IFs should be reported as necessary along with their severity, and they should also be included in the patient records. This would in turn facilitate early treatment or conducting additional examinations for these findings that might be of clinical importance while also eliminating the need for performing repeated examinations for IFs that do not require follow-up, consequently reducing the overall healthcare costs in the long run. Future research should aim to create effective methods for properly reporting and managing IFs in patients admitted to the emergency department for any health-related reasons, including trauma.

Ethics Approval and Consent to Participate

This retrospective study was conducted in accordance with the ethical principles of the Declaration of Helsinki and approved by Malatya Turgut Ozal University Clinical Research Ethics Committee (approval no. 2021/108). Informed consent was not required due to the retrospective nature of the study.

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Author's Contributions

Mehmet Akçiçek: study concept and design, data acquisition, data analysis and interpretation, and writing of manuscript. The author read and approved the final manuscript.

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Conflict of Interest
The authors declare that they have no conflict of interest to declare.

Data Availability Statement
The data supporting this article are available from the corresponding author on reasonable request.

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