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Traumatic lung pathologies confused with COVID-19

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Abstract

While the COVID-19 pandemic affected the whole world, lung radiologic imaging has become widely used for diagnosis. Ground glass opacity is the most detected radiologic findings in pulmonary tomography. However, in the first 6-8 hours of CT scans of patients admitted to the hospital with injuries affecting the chest cavity, single or multiple patchy and/or diffuse ground-glass parenchymal infiltrates can be seen usually. Due to these appearances, it is necessary to eliminate COVID-19 in cases with a lung contusion. This study aims to evaluate the clinical and laboratory characteristics of patients who presented with pulmonary trauma and were suspected of COVID-19 due to lung images. Between the March 2020 and December 2020 pandemic period, patients who applied to our hospital in emergency services due to trauma and who were discharged or hospitalized in COVID services or followed in intensive care units because COVID-19 could not be excluded due to lung tomography findings were included in the study. It was evaluated retrospectively with laboratory tests and thoracic CTs in patients over 18 years old. Fourteen cases were included in the study, seven of them were males (50%), with a mean age of 45 (19-74). The COVID-19 PCR result was negative for all patients except one patient (case 11) with lymphopenia. Peripherally located ground-glass opacity (GGO) (92.9%), subpleural line (85.7%), air bronchogram (64.3%), pleural thickening (64.3%), atelectasis (% 64.3), consolidation (50%), ground glass mixed consolidation (42.9%) was detected in chest CT cases. Eleven cases (78.6%) were hospitalized to the COVID service or intensive care unit. Thoracic CT images of patients with lung trauma may be confused with COVID-19. It is appropriate to evaluate the cases together with epidemiological data, clinical and laboratory findings. Lymphopenia may help physicians to consider the diagnosis of COVID-19 in trauma patients.

Keywords: COVID-19, pulmonary contusion, computed tomography

Introduction

The COVID-19 outbreak started in Wuhan, China in December 2019 and affected the whole world. The World Health Organization (WHO) declared on 11.02.2020 that the epidemic turned into a 'pandemic' [1,2]. The causative agent of COVID-19 infection is "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2), a new member of the coronavirus family, and is included in the Orthocoronavirinae subfamily. The disease can cause different clinical pictures ranging from asymptomatic cases to

severe respiratory failure and death. Therefore, early diagnosis and proper management of cases are very important. In the diagnosis of the disease, polymerase chain reaction (PCR) in nasopharyngeal swab samples and thoracic computed tomography (CT) are used. Chest CT scans of patients with trauma due to contusion and tissue damage that develop during traumas affecting the chest cavity can show findings that may be confused with COVID-19 [3].

In this study, we evaluated clinical, radiologic, and laboratory characteristics of the patients who presented with pulmonary trauma and were suspected of COVID-19 due to pulmonary images.

Materials and Methods

Patients who applied to Hitit University Faculty of Medicine, Erol Olçok Training and Research Hospital between March 21, 2020, and December 31, 2020, after acute trauma and who were

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hospitalized in COVID services and intensive care units after excluded from COVID-19 due to the findings in thoracic computed tomography, or who were followed up in outpatient units were included in the study. The cases were evaluated retrospectively. The data were obtained from the hospital automation system and the file records we kept during the follow-up of the patients.

The diagnosis of COVID-19 is defined as the patient's clinical symptoms and/or suspected contact history and/or COVID-19 positive PCR and/or tomography imaging, according to the algorithm in the ministry of health guide. These cases were evaluated with tomography taken during their admission to our emergency outpatient clinic. PCR samples were taken from patients who were evaluated with infectious diseases, had clinical presentations of COVID-19 symptoms, and had contact with a PCR-positive person. The other patients were sent to their homes with the necessary warnings without taking a PCR sample. The period in which the study was conducted was the first 6 months of the epidemic, and at that time, the decision was made according to the necessary algorithm for the PCR test.

The study was approved by Hitit University Faculty of Medicine Clinical Research Ethics Committee with the 10.03.2021 date and 393 numbered decisions. Necessary permissions were obtained from the Ministry of Health and Erol Olçok Training and Research Hospital.

Results

At the time of the evaluation, 14 patients who presented with acute

lung contusion and were consulted for the exclusion of COVID-19 were included in the study. Seven of the cases were applied to the hospital due to a traffic accident, four due to falling from a height, one to being struck by lightning, one to a penetrating-cutting tool injury (PCTI), and one to assault. Seven of the 11 (78.6%) patients who were hospitalized were male (50%), and the mean age was 45 (19-74).

Two cases were isolated in the ward and the other cases were admitted to the COVID intensive care unit (ICU). PCR test was not taken from a patient (case 2) who was isolated with suspicion of COVID during hospitalization but was not considered as COVID because of the evaluation of an infectious disease specialist. Nine cases were negative for the SARS CoV-2 PCR test, which were transferred to the COVID negative area. Empirical treatment for COVID-19 was initiated in six cases in line with the local guideline recommendations that were in use during their hospitalization. In one case (Case 11) PCR result was positive. The treatment of this case was continued. The treatment of others was terminated within 24-48 hours. The average hospitalization period was found to be 12.8 days. Three cases, one on the day of hospitalization, died due to complications related to trauma. Demographic characteristics and laboratory results of the cases are summarized in Table 1 and CT findings in Table 2-Figure-1.

Three patients (cases 12,13,14) were evaluated in the emergency department for COVID 19 and were not hospitalized and also not requested a sample for PCR. When the patients who were sent home without taking PCR tests were followed for 15 days through our system, it was observed that they did not apply to the hospital with COVID-19 symptoms.

Table 1. Demographic and laboratory results of patients

Patient Number	Hospitalization Diagnosis	PCR	Age-Gender	WBC cell/ml	Lymphocyte cell/ml	Ferritin ng/ml	Fibrinogen mg/dL	CRP mg/L	Hospitalization day	Result
1	IVTA	Negative	33/M	10.26	1.53	254	199	3.79	18	Discharged
2	IVTA	Not taken	24/M	15.15	5.96	-	-	51.1	12	Discharged
3	IVTA	Negative	19/F	15.62	4.2	128.5	324	43.7	8	Discharged
4	UF	Negative	47/M	8.89	1.49	-	-	158	3	Discharged
5	LS	Negative	38/F	18.25	2.35	-	-	3.13	4	Discharged
6	IVTA	Negative	32/F	13.83	7.15	14.73	-	76.4	26	Discharged
7	NVTA	Negative	48/M	11.66	2.53	136.5	335	20.3	2	Discharged
8	A	Negative	68/F	22.21	1.55	115	461	6.44	14	EX
9	PI	Negative	37/M	11.23	4.72	-	-	-	1	EX
10	IVTA	Negative	37/M	25.27	3.98	711.3	-	25.3	21	EX
11	UF	Pozitive	66/F	14.43	0.88	801	879	296	32	Discharged
12	UF	Not taken	66/M	8.4	3.47	-	-	8.49	0	Discharged
13	IVTA	Not taken	43/F	6.93	3.15	-	-	-	0	Discharged
14	UF	Not taken	74/F	10.95	1.53	-	-	3.13	0	Discharged

PCR: Polymerase Chain Reaction, WBC: White blood cells, CRP: C-reactive protein, F: female, M: male, IVTA: In-vehicle traffic accident, UF: Unspecified falling, NVTA: non vehicle traffic accident, PI: penetrating injury, A: assault, LS: lightning strike,

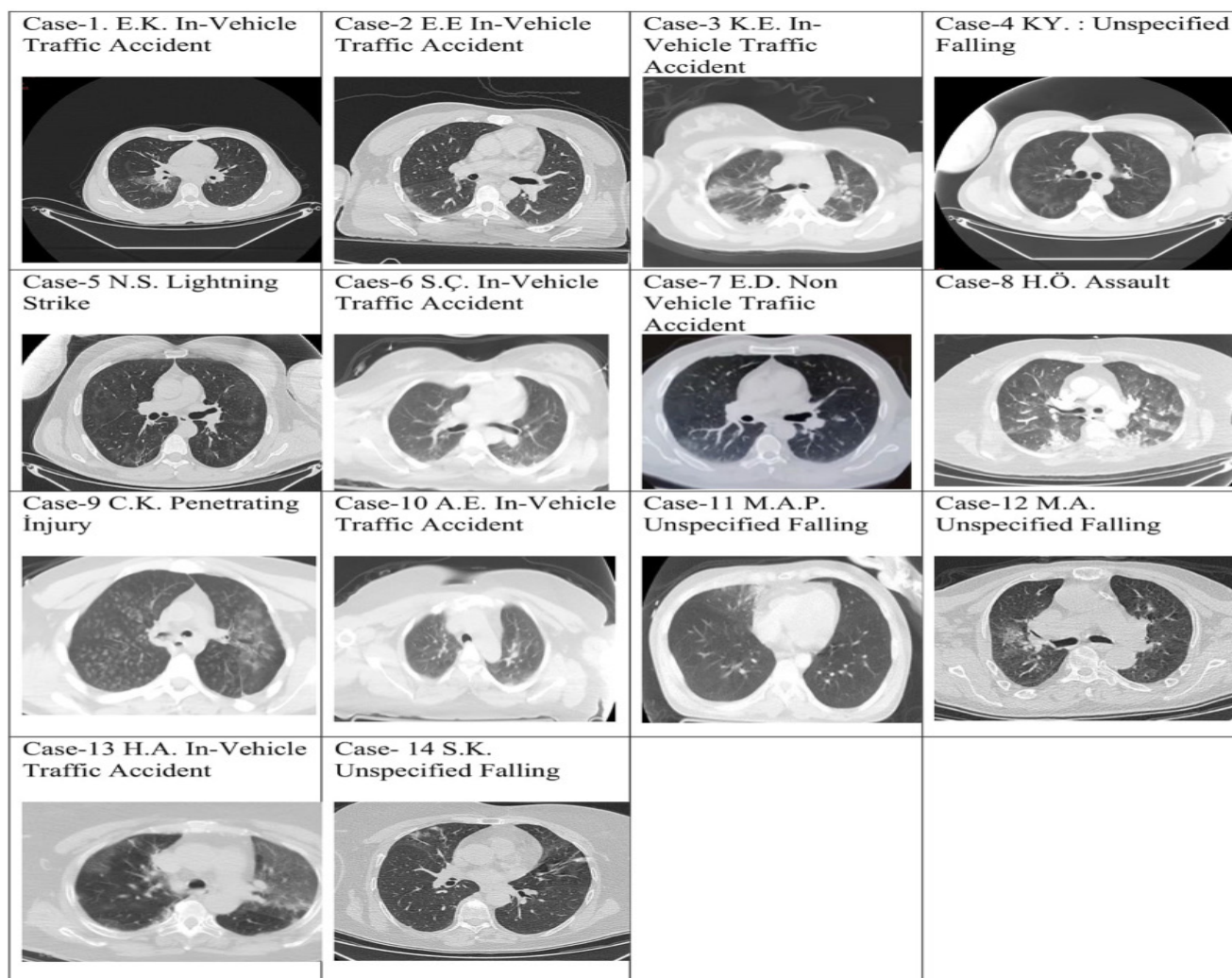


Figure 1. CT Findings

Table 2. Thoracic CT Findings in Patients with Contusion

CT findings	n (%)
Ground glass opacity(GGO)	13(%92.9)
Sub pleural line	12(%85.7)
Air bronchogram	9 (%64.3)
Pleural thickening	9 (%64.3)
Atelectasis	9 (%64.3)
Consolidation asset	7 (%50)
Ground glass mixed consolidation	6 (%42.9)
Bronchial wall thickening	4 (%28.6)
Reverse halo	4 (%28.6)
Bronchiectasis	4(%28.6)
Nodule	4 (%28.6)
Reticular pattern	3 (%21.4)
Emphysema	3(%21.4)
Air bubble	2 (%14.3)
Pneumothorax	1 (%7.1)
Interlobular thickening	0 (%0)
Pleural effusion	0 (%0)
Lymphadenopathy	0 (%0)
Pericardial effusion	0 (%0)

Discussion

COVID-19 was spotted in Wuhan, China in December 2019 with a cluster of severe pneumonia cases transmitted from person to person. The disease caused by the coronavirus (SARS-COV-2) spread all over the world in 2020 and turned into a pandemic. During this process, only COVID-19 cases were engaged in medical organizations, except for emergency cases.

Because SARS-COV-2 acts by binding to ACE 2 receptors, it is clustered in the respiratory system where ACE 2 receptors are dense, leading to different clinical tables, from cases with mild respiratory symptoms to cases that lead to severe pneumonia and respiratory failure [4,5]. The virus spreads rapidly through contact and droplets, asymptomatic cases playing a role in transmission as well as symptomatic cases. Breaking the transmission chain depends on strict isolation and infection control measures [6]. The diagnosis of COVID-19 is based on the detection of the virus by PCR test in nasopharyngeal swab samples. However, since the PCR test cannot be performed everywhere, the test takes time and it can give false-negative results (25-45%), thoracic CT is used in addition to PCR for diagnosis [1,5,7,8]. In various studies, it has been reported that CT used in the diagnosis of COVID-19 has high sensitivity (97-98%) [2,9]. In some publications, it is reported that CT may be normal at an early stage (56%), while in some it may

also be diagnostic in newly infected patients [5,10]

The most specific thoracic CT finding identified in COVID-19 is bilateral, peripherally located ground-glass opacities (GGO). This appearance is typical of the disease and occurs at a frequency of 57–98% [11]. GGO is usually located at the base of the pleura [5]. Lesions progress towards peri lobular thickening and consolidations (2-65%). An increase in the number and density of lesions indicates progression [10,12]. Reverse halo, centrally consolidated peripheral ground-glass appearance, bronchial wall changes (wall thickening/bronchiectasis) (10-20%), thin subpleural lines extending parallel to the pleura (20%), pleural wall thickening (32%) on CT scans of COVID-19 cases., pleural effusion (5%), pericardial effusion (5%) and lymphadenopathy (4-8%) have also been reported [11].

All cases applied to emergency departments due to the risk of transmission are treated as COVID-19, so COVID-19 is often included in the differential diagnosis of patients admitted for different reasons and with respiratory signs.

During pulmonary contusion, which develops in injuries affecting the chest cavity, damage to the alveolar cells and capillaries in the parenchyma of the lungs occurs. As a result, bleeding, interstitial edema, atelectasis, and pulmonary consolidations occur, leading to respiratory symptoms.

In the CT scans of these cases within the first 6-8 hours, single or multiple patchy or diffuse ground glass-shaped parenchymal infiltrations can be seen sitting on the pleura [4]. The lesions increase gradually over time, the involvement may progress within 24-48 hours, and atelectasis may be seen in progressed cases. But it regresses within 7-10 days without leaving a mark. CT findings have similarities and differences with the radiological images of COVID-19 [5]. Localization of lesions in pulmonary contusion is typically in the subpleural area at the impact site. About the severity of the impact, bilateral, multifocal peribronchial ground-glass areas (GGO) and/or consolidations may develop on the healthy side, like those seen in COVID-19 radiology [13,14].

In some cases, there is laceration and gas accumulation. In case of extensive pleural effusions and hemothorax seen, pulmonary contusion rather than COVID-19 should come to mind.

Air bronchograms are a finding that can be seen in both contusion and COVID-19. Pulmonary contusion stabilizes within 24 hours. Another diagnosis should be considered if it progresses within 48 hours. In COVID-19, on the contrary, the severity and number of lesions continue to increase in connection with the clinical course [2].

Given the chest CT findings of pulmonary contusion, it is necessary to exclude COVID-19 during the pandemic process we are experiencing. But it is difficult to make this distinction with CT findings, as we have seen in the cases in our study.

It can't help enough to make a distinction in clinical findings. Because fatigue, fever, dry cough, muscle aches, and shortness of breath found in severe cases, which are the most common signs of COVID-19, are the signs that we can also see in pulmonary contusion [10,13,14].

Looking at laboratory tests; during COVID-19, a viral infection, the number of leukocytes usually decreases or remains the same, leukocytosis is not an expected finding. Lymphopenia is present in most cases. In cases with pulmonary contusion, leukocytosis is usually observed, and lymphopenia is not very common [8].

From cases applied to our hospital due to trauma during the pandemic, those with thoracic CT findings were referred to the emergency covid outpatient clinic for COVID-19 partition. COVID-19 was not considered with epidemiological history, clinical findings, and laboratory findings in three cases (cases 12,13,14), and COVID was not excluded in eleven patients. Leukocytosis (mean leukocyte 13.81/109L) was detected in all but one of the cases, and lymphopenia in one case was remarkable in terms of COVID-19. Lymphopenia is an important parameter that is common in COVID-19 cases and requires follow-up at the angle of prognosis. COVID PCR was positive in our only case with lymphopenia (Case 11). One case was hospitalized due to a penetrating cutting tool injury died during the operation on the day it was hospitalized, and two cases were lost due to trauma during their follow-up. In the case of positive PCR, the disease was severe, the patient was given antiviral therapy, as well as immunosuppressive treatments such as Anakinra and Dexamethasone, and the patient was discharged.

The limitations of this study were the retrospective nature of the study and the small number of cases included in the study.

Conclusion

During the pandemic period, traumatic lung radiological images are frequently confused with COVID-19 and should be evaluated together with epidemiological data and clinical findings. The presence of lymphopenia may help the clinician as a finding that supports the suspicion of COVID-19 and if necessary, a COVID PCR test should be taken. Patients should be isolated and monitored until COVID-19 is ruled out, especially patients with lymphopenia should be considered for the SARS Cov 2 infection at an early stage.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical approval

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