

Case Report

Management of pulmonary contusions during the COVID-19 pandemic

Daiki Eguchi,¹ Hiroshi Adachi, Kwonil Choi, and Koji Yonemori

Department of Emergency Medicine, Intensive Care Unit, Yonemori Hospital, Kagoshima, Japan

Background: Coronavirus disease (COVID-19) is an emerging infectious disease with human-to-human transmission. Early identification of patients with COVID-19 is important in preventing its spread.

Case presentation: A 36-year-old man with a fever for 3 days fell from the 5th floor and was transported to our emergency department. Pan-scan computed tomography (CT) revealed multiple ground-glass opacities just below the pleura, pelvic fractures, thoracic vertebral fracture (Th11), and right femoral fracture. COVID-19 was ruled out based on negative real-time reverse transcription–polymerase chain reaction results on days 2 and 3, and a reduction in the multiple ground-glass opacities on CT carried out on day 5. Until the suspicion of COVID-19 was cleared, strict and standardized processing procedures were implemented in the same way as for a patient with COVID-19.

Conclusions: It is very difficult to rapidly differentiate between pulmonary contusions and COVID-19, as these conditions have many similarities on CT.

Key words: Computed tomography, COVID-19, multiple injuries, pulmonary contusion, real-time reverse transcription–polymerase chain reaction

INTRODUCTION

SEVERE ACUTE RESPIRATORY syndrome coronavirus 2 has become a pandemic,¹ and a nationwide state of emergency was declared on the 16 April, 2020 in Japan. Severe acute respiratory syndrome coronavirus 2 causes an illness referred to as coronavirus disease (COVID-19). Japan currently has more than 16,000 patients with COVID-19, of which more than 800 have died.² COVID-19 is mild in most people, but progresses to pneumonia, acute respiratory distress syndrome, and multiple organ dysfunction in some people, usually older adults or those with comorbidities. The fatality rate of COVID-19 is estimated to range from 2% to 3%.³ Early identification and proper management of patients with COVID-19 are important to prevent nosocomial infection. The chest computed tomography (CT) findings of peripheral subpleural consolidation and ground-glass opacity (GGO) in COVID-19 are similar to the

findings in patients with pulmonary contusions, which is the most common complication of blunt chest trauma. Misdiagnosis of COVID-19 as pulmonary contusions could have serious consequences if precautions to prevent the spread of COVID-19 are not undertaken.

Herein, we describe a case in which a patient with fever and fatigue fell from a height and presented to our emergency department with CT findings similar to those seen in patients with COVID-19. We had to differentiate between pulmonary contusions and COVID-19. Such cases must be carefully managed to prevent the spread of COVID-19 in the emergency department.

CASE REPORT

DURING THE COVID-19 pandemic, a 36-year-old man with a history of schizophrenia fell from the 5th floor and was transferred to our emergency department. He had a fever and fatigue for 3 days before he fell and worked in a factory with three C's (closed spaces, crowded places, and close-contact settings), but had not had any contact with any patient with COVID-19. The primary physical examination findings were: an intact airway, respiratory rate of 22 breaths/min, SpO₂ of 92% (room air), no subcutaneous emphysema or frail chest, heart rate of 113 b.p.m., blood

Corresponding: Daiki Eguchi, MD, PhD, Department of Emergency Medicine, Yonemori Hospital, 1-7-1 Yojirou, Kagoshima 890-0062, Japan. E-mail: d-eguchi@surg1.med.kyushu-u.ac.jp.

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pressure of 104/66 mmHg, active bleeding from both lower limbs, Glasgow Coma Scale score of 14 (E4V4M6), pupils equal and reactive at 3 mm, no hemiplegia, and body temperature of 37.6°C. The laboratory findings showed an elevated D-dimer (36.0 µg/mL), a slightly elevated white blood cell count ($109 \times 100/\mu\text{L}$), low lymphocyte count (13.7%), and normal C-reactive protein level (<0.02 mg/dL). Pan-scan CT showed multiple GGOs just below the peripheral pleura, without rib fractures and/or traumatic pulmonary pseudocysts (Fig. 1). Computed tomography also revealed fractures of the pelvis, 11th thoracic vertebra, and right femur and calcaneus. We strongly suspected that the pulmonary findings were due to pulmonary contusions, but could not rule out COVID-19. Although his fever continued even after hospitalization, the results of real-time reverse transcription–polymerase chain reaction (RT-PCR) for COVID-19 carried out on days 2 and 3 were negative (Fig. 2). Moreover, CT carried out on day 5 showed less GGOs and localization of the pulmonary contusions compared with initial CT (Fig. 3). Therefore, COVID-19 was ruled out. Until the repetitive RT-PCR tests were negative, strict and standardized processing procedures were implemented for the patient in the same way as for a patient with COVID-19. He subsequently received multiple orthopedic surgeries. Computed tomography carried out on day 14 revealed no GGOs, with further reductions in the other shadows produced by the pulmonary contusions.

DISCUSSION

WE REPORT A case in which it was difficult to distinguish between COVID-19 and pulmonary contusions on CT. As the patient had a fever during the COVID-19 pandemic, we had to treat him as a patient with suspected COVID-19. Chen *et al.*⁴ reported a case of suspected

COVID-19 in a patient with pulmonary contusions who had come into contact with people infected with COVID-19. Although our CT findings were similar to the findings described in this previous report,⁴ our patient had symptoms but no history of contact with COVID-19. However, the patient continued to work in three C's environments despite the risk of infection.

The common symptoms of COVID-19 are fever, cough, and myalgia, or fatigue.⁵ Laboratory tests could reveal elevated levels of C-reactive protein, lactate dehydrogenase, D-dimer, and creatinine, an elevated erythrocyte sedimentation rate, and a prolonged prothrombin time.⁶ Chest CT is useful for the detection of COVID-19, and the characteristic findings include the involvement of more than two lobes, GGOs, opacities with a rounded morphology, and a peripheral distribution of disease.⁷ Although RT-PCR seems to have a high specificity for COVID-19, there may be false-positive results due to swab contamination, especially in asymptomatic patients. The sensitivity rate of RT-PCR for COVID-19 is not clear, but is estimated to be 66–80%.⁸ Therefore, the Infectious Diseases Society of America suggests that repeat RT-PCR testing should generally be undertaken 24–48 h after initial testing.⁹ Based on diagnostic confirmation with positive RT-PCR results, the sensitivity of chest CT in detecting COVID-19 is 97%.⁸ In the present case, COVID-19 was suspected because of the symptoms of fever and fatigue and the presence of multiple GGOs peripherally in more than two lobes but in unilateral lesion. Shi *et al.* reported that 60% of subclinical patients with COVID-19 before symptom onset had GGOs unilaterally.⁹ We were able to rule out COVID-19 by repeat negative RT-PCR findings, and amelioration of CT findings contributed to excluding the diagnosis of COVID-19 infection.

Pulmonary contusion is defined as damaged alveolar capillaries due to blunt trauma. Pulmonary contusions occur in

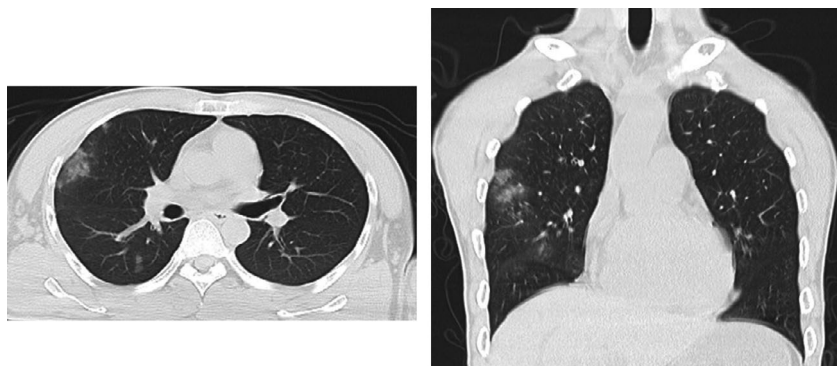


Fig. 1. Chest computed tomography on admission of a 36-year-old man with pulmonary contusions. There are ground-glass opacities in the peripheral lesion just below the pleura of the right middle and lower lobes.

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