Imaging Findings in Four COVID-19 Patients

Ariel Kerpel MD[1,3], Noam Nissan MD[1,3], Maximiliano Klug MD[1,3], Sharon Amit MD PhD[2,3], Eli Konen MD[1,3] and Edith M. Marom MD[1,3]

[1]Department of Diagnostic Radiology and [2]Clinical Microbiology, Sheba Medical Center, Tel Hashomer, Israel
[3]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

KEY WORDS: corona virus, COVID-19, SARS-CoV-2, chest radiograph, computerized tomography

IMAJ 2020; 22: 214–215

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has reached pandemic proportions [1]. The most common presenting clinical symptoms are fever and cough. Other non-specific symptoms include dyspnea, headache, muscle soreness, and fatigue [2]. The disease has a high mortality rate in high-risk populations, such as the elderly and those with a medical history of diabetes, hypertension, and other co-morbidities. The disease spreads easily and rapidly [1].

In this brief case series, we present the imaging findings of four COVID-19 patients confirmed by a positive real-time polymerase chain reaction (RT-PCR) test at our institution.

This retrospective analysis was approved by our institutional review board.

PATIENT DESCRIPTION

PATIENT 1

A 62-year-old man with a background of ischemic heart disease, coronary artery bypass surgery, cigarette smoking, type 2 diabetes mellitus , hypertension, and dyslipidemia presented to the emergency department (ED) with a 7-day history of cough, fever, and fatigue. He was treated in the community with antibiotics for 2 days. The patient was admitted to a dedicated corona virus department [Figure 1].

PATIENT 2

A 60-year-old man with a background of cigarette smoking and hypertension, presented to the ED with a 10-day history of fever, fatigue, as well as syncope on the day of presentation. The patient was admitted to a dedicated corona virus department [Figure 2].

PATIENT 3

A 60-year-old man with a remote history of prostatectomy for prostate cancer, presented to the ED with a 5-day history of dry cough, fever, and nasal congestion. He was discharged for home isolation [Figure 3].

PATIENT 4

A 59-year-old obese man, past smoker with a background of inflammatory bowel disease, presented to the ED with a 6-day history of fever, fatigue, cough, shortness of breath, and diarrhea. He reported contact with a known COVID-19 patient. The patient was admitted to a dedicated corona virus department, deteriorated, and was transferred to a dedicated corona virus intensive care unit one day after initial admission [Figure 4].

COMMENT

Viral nucleic acid detection using RT-PCR is the standard reference for COVID-19 diagnosis.

Patients with COVID-19 present with non-specific findings on chest radiographs. These typically show bilateral, lower lobe predominant peripheral opacities in the absence of pleural effusions or lymphadenopathy. A study from Hong Kong [3] found that the sensitivity of chest radiography in identifying COVID-19 pneumonia is 69%.

Routine screening computerized tomography (CT) for the identification of COVID-19 pneumonia is currently not recommended by most radiology societies [1,4] due to the lack of specificity of this exam. Nevertheless, as this disease is rapidly spreading, patients with or without respiratory symptoms may be imaged with chest CT, and it is essential to recognize the pattern of disease to alert the treating team of the suspicion of this contagious disease.

On CT, COVID-19 usually manifests as ground-glass opacities (GGO), which per definition are hazy increased opacities, with preservation of bronchial and vascular margins. They may appear with a slight thickening of the intralobular septa, resembling the "crazy paving pattern" or may have a nodular appearance. These opacities are usually multilobar and have a predilection to the periphery of the lungs and the posterior lower lungs [1,2]. Many patients have a diffuse pattern when imaged, and with time, these opacities become denser, and form consolidation, meaning, that they obscure the margins of vessels and bronchial walls. These described findings are not specific and can mimic other infections (especially influenza) and non-infectious inflammatory processes [1]. Lymphadenopathy and pleural effusions are rare [1].

Figure 1. Frontal chest radiograph of a 62-year-old man with a 7-day history of fever and cough, obtained 7 days after symptom onset. There are bilateral peripheral opacities, consolidation on the left (straight arrows) and more subtle heterogeneous opacities on the right (curved arrows), predominantly in the lower lungs. There are no pleural effusions. There are sternotomy wires from prior coronary artery bypass surgery

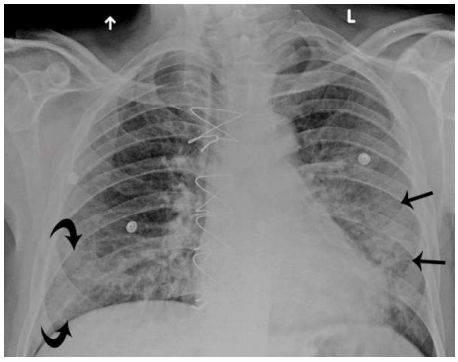

Figure 2. Frontal chest radiograph of a 60-year-old man with a 10-day history of fever and fatigue, obtained 10 days after symptom onset. There are subtle bilateral peripheral heterogeneous opacities (arrows) without full consolidation. There are no pleural effusions

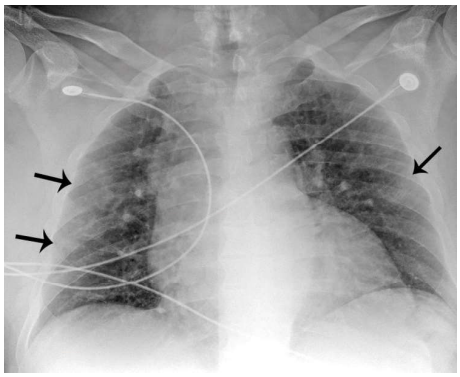

Figure 3. Frontal chest radiograph of a 60-year-old man with a 5-day history of cough and fever. There are bilateral opacities with lower lung predominance: consolidation in the right lower lung (curved arrow) while more subtle opacities are seen in other regions (straight arrows). There are no pleural effusions

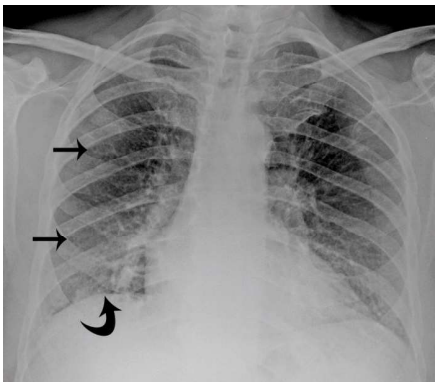

Figure 4. A 59-year-old man with a 6-day history of fever, fatigue, cough, and shortness of breath. Frontal chest radiograph **[A]** obtained 6 days after symptoms onset shows lower lobe predominant bilateral consolidation which obscures the left hemidiaphragm. There are no pleural effusions. Unenhanced chest CT **[B,C]** performed one day later **[B]** shows peripheral ground-glass opacities, some distributed in a nodular fashion (curved arrow **[C]** coned down view at the level of the takeoff of the right upper lobe bronchus, demonstrates the 'crazy paving pattern', thickened intralobular septa superimposed on ground glass opacities (straight arrows)

During the disease, the most extensive opacities are usually reached by the tenth day after symptom onset. However, up to 56% of patients have a normal chest CT in the first few days of infection, despite being ill with COVID19 pneumonia; Hence a normal chest CT, and most certainly chest radiograph, cannot rule out COVID-19 [1,2,5].

CONCLUSIONS

Typical chest imaging findings in patients with COVID-19 are peripheral multilobar opacities with a posterior and lower lung predilection. Early in the disease course (< 2–4 days), patients often show no imaging abnormalities by CT and chest radiography. A normal chest radiograph or CT cannot be used to exclude COVID-19 at presentation.

Correspondence
Dr. A. Kerpel
Dept. of Diagnostic Imaging, Sheba Medical Center, Tel Hashomer 5265601, Israel
Phone: (972-3) 530-2530, **Fax:** (972-3) 535-7315, **email:** arikerp@gmail.com

References

1. Simpson S, Kay FU, Abbara S, et al. Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. *Radiol Cardiothorac Imaging* 2020; 2 (2): e200152.
2. Bernheim A, Mei X, Huang M, et al. Chest CT Findings in coronavirus disease-19 (COVID-19): relationship to duration of infection. *Radiology* 2020; 200463.
3. Wong HYF, Lam HYS, Fong AH-T, et al. Frequency and distribution of chest radiographic findings in covid-19 positive patients. *Radiology* 2019; 201160.
4. Rubin GD, Haramati LB, Kanne JP, et al. The role of chest imaging in patient management during the COVID-19 pandemic: a multinational consensus statement from the fleischner society. *Radiology* 2020; 201365.
5. Pan F, Ye T, Sun P, et al. Time course of lung changes on chest CT during recovery from 2019 novel coronavirus (COVID-19) pneumonia. *Radiology* 2020; 200370.