Incidental Detection of Coronavirus Disease-2019 on Magnetic Resonance Imaging

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The outbreak of an acute respiratory disease mysteriously took place in the city of Wuhan, China, during December 2019 [1]. Coronavirus disease-2019 (COVID-19), caused by a novel zoonotic coronavirus: severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has since spread rapidly and reached pandemic proportions [1]. The severity of disease is broad, varying from asymptomatic infection and mild upper respiratory tract illness to severe pneumonia with respiratory failure and even death [1]. Male gender, older age, and medical co-morbidities were found to be associated with a higher fatality risk [1]. The diagnosis of COVID-19 infection is currently confirmed by reverse transcriptase polymerase chain reaction (RT-PCR) using nasopharyngeal swabs [2]. Although detection of viral RNA remains the gold standard for diagnosis, false-negative results are not uncommon [2]. Further limitations of PCR include a potential shortage of polymerase chain reaction (PCR) kits and delayed diagnosis when the need for rapid decision-making for symptomatic patients with a high index of clinical suspicion is needed to reduce disease spread. Therefore, imaging studies, mainly chest radiography and computer tomography (CT), have been utilized as screening and diagnostic tools [3-5].

Typical findings on chest CT consist of ground-glass opacities or bilateral pulmonary consolidation, mostly in a posterior and peripheral distribution. These features were suggestive of infection, although they were not specific [3-5]. As a result, there is still no consensus for the use of imaging in the clinical assessment and management of patients with suspected COVID-19 pneumonia [4]. Currently, magnetic resonance imaging (MRI) has no definite role in the diagnostic workup of COVID-19. In this case study, we reviewed a case in which incidental MRI findings in a young patient raised suspicion and prompted the diagnosis of COVID-19.

PATIENT DESCRIPTION

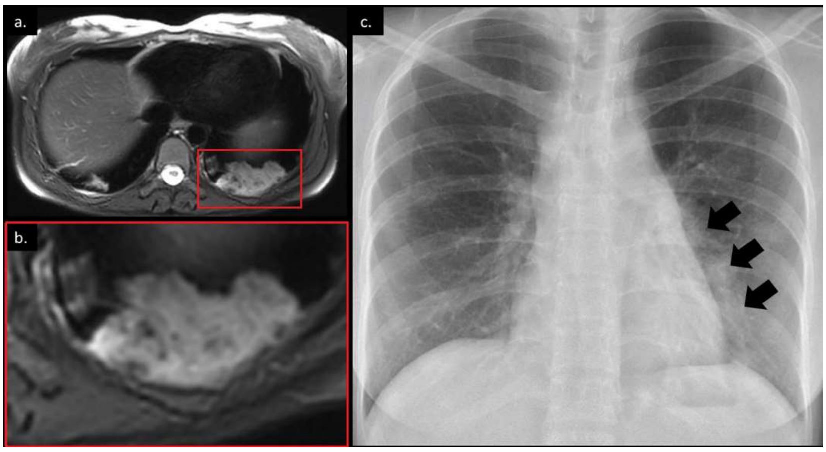
A 23-year-old woman complaining of episodes of headaches, pre-syncope, and amaurosis fugax, during the past year was admitted to the neurology department for investigation. Apparently, during her initial evaluation in the emergency department on hospital day 1, the patient was exposed to a nurse who was subsequently diagnosed with PCR-confirmed COVID-19. Following a hospital epidemiologic investigation, the patient, despite being asymptomatic, underwent a swab test for SARS-CoV-2 RNA on day 7 of her hospitalization, which returned negative.

As part of her work-up, a chest MRI was performed on day 2 of hospitalization, which revealed occlusion of the subclavian arteries, significant stenosis of the vertebral and carotid arteries, and aortic wall thickening. These findings were followed by additional imaging studies, including CT angiography of the neck, which demonstrated carotid artery irregularities and stenosis. Under the working diagnosis of Takayasu arteritis, the patient was treated with a course of steroids and methotrexate with clinical and radiological improvement of the carotid artery ultrasound Doppler performed on day 16 of hospitalization.

On day 19 of hospitalization, the patient developed a cough, subfebrile fever, and elevated C-reactive protein (CRP) levels, which suggested an inter-current infection. An anterior-posterior chest radiograph was performed on day 20 of hospitalization, which was not interpreted by a radiologist. Her attending neurologist described the chest radiograph as normal. Due to abdominal symptoms, on day 21 of hospitalization, an magnetic resonance angiography (MRA) scan of the abdomen was obtained, which revealed aortic wall thickening, as well as pulmonary opacities. which were included in the examiner’s field of view (FOV). The reporting radiologist immediately studied the patient's previous two chest radiographs, including one performed on the same day as the MRI. Both scans demonstrated marked consolidation in the left lower lobe with minimal opacities in the right lower lobe, corroborating with the MRI findings [Figure 1]. The patient was promptly isolated and a repeated PCR test was conducted, which returned positive. Under the diagnosis of mild COVID-19 pneumonia, the patient

Figure 1. Magnetic resonance imaging (MRI) and chest radiography findings suggestive of coronavirus-19 pneumonia

[A] Respective focused image (×3) of the left lower lobe consolidation, **[B]** Chest radiograph performed the same day, **[C]** highlighting the left lower lobe consolidation (arrows)



MRI 3T scanner (Phillips, Ingenia, Philips Healthcare, Best, The Netherlands) equipped with a body coil. Typical bilateral posterior peripheral consolidation is seen in the lungs on: axial fat suppressed T2-weighted image (FOV 400, matrix 480 × 480, slice thickness 7 mm, TE/TR 134/2725 ms)

was isolated and transferred to a newly designated COVID-19 department for continued care.

COMMENT

We report on an incidental detection of COVID-19 pneumonia by MRI. The imaging feature that raised suspicion for infection was new bibasilar consolidation. This imaging manifestation is in accordance with previously published observations, described on conventional chest imaging modalities, CT scans, and radiography reports [3-5]. Nevertheless, bilateral involvement of the lung parenchyma is not specific for COVID-19 and can be found in a variety of other benign and malignant pulmonary disease processes [3-5].

Currently, in the clinical setting, the role of MRI in chest imaging remains limited due to technical drawbacks. Although MRI should not be routinely used in the diagnostic work-up of suspected COVID-19, our case demonstrates how the typical imaging manifestations of the disease manifested clearly on MRI. Furthermore, the fact that the suspicious findings in our case were observed in an abdominal MRA examination, which provides limited lung coverage, only highlights the importance of a high index of radiological suspicion required during the COVID-19 pandemic in all exams that include a portion of the lungs. Moreover, COVID-19 cannot be excluded even in patients with a negative PCR, especially in symptomatic patients with a known exposure, such as in our case. Therefore, MRI scans of the neck, shoulder, heart, breast, abdomen, thoracic, and lumbar spine should all be carefully assessed for incidental lung opacities that necessitate further investigation and immediate isolation, in order to prevent further spread of COVID-19.

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Capsule

Safeguarding the sense of smell

Given the proximity of the olfactory bulb to the upper airways, it is surprising that viruses that infect the upper airways, including influenza, rarely infect the brain. In mice, intranasal infection with vesicular stomatitis virus (VSV) does result in infection of sensory neurons in the olfactory bulb. Using VSV that expresses a fluorescent reporter, **Moseman** and co-authors examined the ability of VSV to infect distinct cell types within the olfactory bulb. Although VSV infection was restricted to neurons within the olfactory bulb, they found that microglial cells that were not infected by VSV were key in priming T cell responses that promoted viral clearance.

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