Role of CT in detection of COVID-19

In December 2019, a lower respiratory tract febrile illness of unknown origin was reported in a group of patients in Wuhan City, Hubei Province, China. A new strain of coronavirus was isolated from these patients which was later called coronavirus disease 2019 (COVID-19) by the World Health Organization.[1]

Although governmental health authorities and medical literature suggest the diagnosis of COVID-19 is suspected based on clinical symptoms and patient history (such as travel or exposure to someone with those risk factors), as well as positive reverse-transcription polymerase chain reaction (RT-PCR) testing, according to the referenced literature chest imaging may play a role in detection and follow-up of these patients.[1]

Chest x-rays do have a potential to serve as a screening tool in medical settings with high disease prevalence but limited resources.[2,3] Chest x-ray findings of patchy or diffuse asymmetric airspace opacities have been reported.[2]

The referenced literature reports that CT imaging of the chest is, however, much more sensitive in detecting findings concerning for COVID-19 than chest radiographs. Several studies have reported that the presence of typical CT findings, in the appropriate clinical setting, could be helpful in the initial screening of individuals who are suspected to have the virus. Results could aid in detection, quarantine and treatment of these patients. Although the CT findings seen with COVID-19 do overlap with other viral illnesses, the clinical picture is critical in the interpretation of these imaging studies.[2]

The referenced literature suggests that imaging characteristics of COVID-19 do overlap with both MERS (Middle East Respiratory Syndrome) and SARS (Severe Acute Respiratory Syndrome), as well as other viral illnesses. Bilateral lung findings on initial imaging are more likely seen with COVID-19, in contradistinction to MERS and SARS. It should be noted that initial CT imaging maybe negative, and a negative or normal chest imaging exam does not necessarily exclude a COVID-19 infection. This may be related to the fact that COVID-19 has an incubation period of several days, and there may be a prodromal phase where viral infection manifests with symptoms before the emergence of imaging manifestation.[3,4]

In one study out of Wuhan China, 97% of patients confirmed by RT-PCR assays showed positive findings on chest CT.[4] Furthermore, this study documented up to 93% of patients had initial positive chest CT findings consistent with COVID-19 before positive RT-PCR results. Additionally, 42% of patients showed improvement on follow-up chest CT scans before the RT-PCR results turned negative.[4]

The chest CT findings in individuals with confirmed COVID-19 include multifocal ground-glass opacities and consolidation, with a peripheral lung predilection. Pleural effusion, cavitation, pulmonary nodules, and lymphadenopathy have not been reported in patients with COVID-19.[1]

As the RT-PCR can be falsely negative due to laboratory error or insufficient viral material at the time the sample was taken, CT features of viral pneumonia may be strongly suspicious for COVID-19 infection despite negative RT-PCR results.[5] Thus, in patients with an initial negative RT-PCR tests, a combination of exposure history, clinical symptoms, and typical CT imaging features could be used to identify COVID-19.[4]

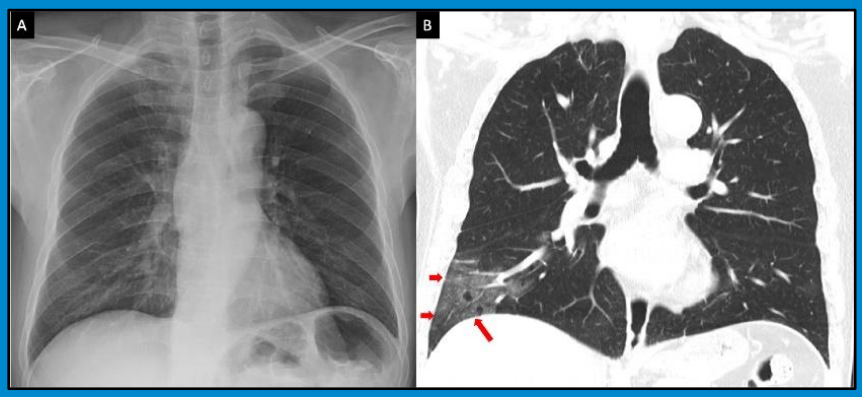
Follow-up imaging should be performed in individuals recovering from COVID-19 to look for evidence of chronic involvement of the lungs (i.e., interlobular thickening, air trapping, or fibrosis).[1,3,4]

This summary is not meant to supplant normal procedures, evaluation, diagnosis, research, education, treatment and/or care plans for patients. Professional judgement must be exercised and followed in all respects with regard to the treatment and care of patients.

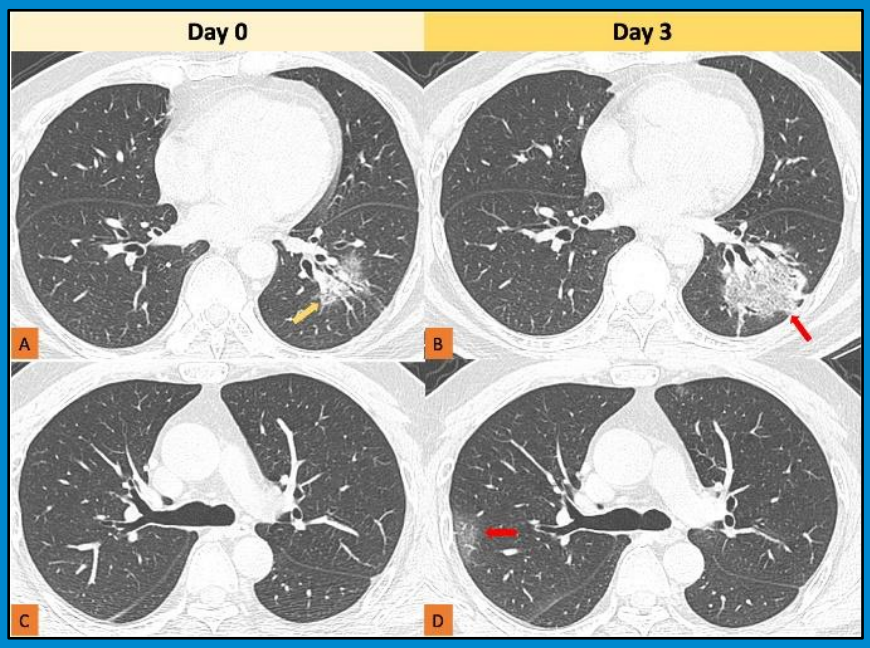
See next page for position statement and sample imaging.

POSITION STATEMENT

Many of these patients will be screened in the ER or in the inpatient setting. However, for outpatients with a clinical history concerning for COVID-19 illness, even in the absence of a positive RT-PCR testing and prior chest x-rays (normal or abnormal), a chest CT exam may aid in the detection, quarantine and treatment of these patients. As many states declare States of Emergency, it is expected prior authorization for chest CT will not have a role in utilization review.



Comparison of chest radiograph (image A) and CT thorax coronal image (image B). The ground glass opacities in the right lower lobe periphery on the CT (red arrows) are not visible on the chest radiograph, which was taken 1 hour apart from the first study.[6]



CT chest follow-up in a patient who had no previous travel to Wuhan, China, but had contact with a patient with confirmed COVID-19 infection. Axial slices from day 0 of presentation to the hospital shows ground-glass opacities in the left lower lobe (image A, arrow), but not in the right upper lobe (image C). Subsequently, 3 days later, the follow-up CT showed increase in the ground glass changes with some peripheral consolidation (reversed halo, image B, arrow) and new ground-glass opacities in the right upper lobe periphery (image D, arrow).[6]

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