



# The indispensable role of chest CT in the detection of coronavirus disease 2019 (COVID-19)

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Received: 18 March 2020 / Accepted: 27 March 2020  
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Dear Sir,

We have read with interest the original article published online of the EJNMMI [1]. The authors introduced the imaging and clinical characteristics of SARS-CoV-2 infected patients in Guangzhou, China. Notably, they reported the fact that a few patients who initially had negative nucleic acid test results presented characteristic pneumonia features on CT. In contrast, another small proportion of confirmed cases had a negative baseline CT scan. With a speedily spread of the SARS-CoV-2 infection (COVID-19) worldwide, we need a more rounded view on the role of chest CT in the detection of COVID-19, which is still in controversy.

Currently, RT-PCR-based viral nucleic acid assay is used as the reference standard method to confirm COVID-19 infection [2]. However, such a laboratory test is time-consuming, and the supply of test kits may be the bottle-neck for a rapidly growing suspicious population even for many developed countries such as the United States. More importantly, initial false-negative or weakly positive RT-PCR test results were found in some later-confirmed cases, whereas highly suspicious CT imaging features were present [1, 3]. While the exact reason is still under investigation, it may be caused by insufficient quantities of viral microbes extracted for testing or incorrect extraction methods were used. Considering the exponentially increasing number of COVID-19-infected patients worldwide, these patients with initial false-negative RT-PCR test results are not trivial and could lead to occult transmission in key infection areas.

Chest CT is an indispensable tool for early screening and diagnosing suspected COVID-19 patients. Previous studies confirmed that the majority of patients infected with COVID-19 exhibited common chest CT characteristics, including ground-glass opacities and consolidation, which reflect lesions affecting multi-lobes or infections in bilateral lung parenchyma [1, 3]. Increasing evidence suggested that these chest CT characteristics can not only be used to screen suspected patients but also serve a diagnostic tool for COVID-19-caused acute respiratory diseases (ARDS) [3]. These findings have led to the modification of the diagnosis and treatment protocols of SARS-CoV-2-caused pneumonia to include patients with characteristic pneumonia features on chest CT but negative RT-PCR results in severe epidemic areas such as Wuhan city and Hubei province [4]. Meanwhile, patients with negative RT-PCR but positive CT findings should be isolated or quarantined to prevent clustered or wide-spread infections. The critical role of CT in early detection and diagnosis of COVID-19 becomes more and more publicly acceptable.

However, several studies also reported that a proportion of RT-PCR positive patients, including some severe cases, had initially normal chest X-ray or CT findings [1, 5, 6]. According to the diagnostic criteria of COVID-19, patients might have no or atypical radiological manifestations even at the mild or moderate stages. This can be attributed to the fact that some lesions are easily missed in the low-density resolution of chest X-ray, suggestive of chest CT may be a better modality with a lower false-negative rate. Another possible explanation is that, in some patients, the targeted organ of COVID-19 may not be the lung. Multiple organ dysfunctions, including ARDS, acute cardiac injury, hepatic injury, and kidney injury, have been reported during COVID-19 infection [7]. For those patients with severe clinical symptom but 'normal' chest imaging findings, comprehensive exams should be performed to prevent multiple organ impairment. Regardless of the reasons, the absence of characteristic chest CT features in some COVID-19 patients remains a hurdle for accurately early screening and detection.

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This article is part of the Topical Collection on Letter to the Editor.

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Studies were also reported the chest CT appearances in COVID-19 patients after treatment, suggestive of its critical role in treatment evaluation and follow-up. For example, a study investigated the change in chest CT findings associated with COVID-19 at different time points during the infection course [8]. The results showed that most apparent abnormalities on chest CT were still observable for ten days but disappeared at 14 days after the initial onset of symptoms. Interestingly, a case report showed pre- and post-treatment chest CT findings of a 46-year-old woman whose RT-PCR result became negative while pulmonary lesions were reversal [9]. Reports about the long-term longitudinal development of imaging features and correlation with pathological assessment in COVID-19 patients are still lacking.

In conclusion, strong clinical evidence shows that chest CT has an indispensable role in early detection and diagnosis of COVID-19 infection by providing fast and sensitive detection of COVID-19-caused lesions in the lung, and hence a probable diagnosis of COVID-19. Most severe cases showed positive chest CT findings with only a few exceptions. Together with epidemical exposure history, clinical symptoms, and lab tests, chest CT has the capacity to diagnose COVID-19 patients with negative nucleic acid testing results. In some severe patients who have progressive symptoms but no or mild abnormal CT appearances, multiorgan damages are likely the reason and an immediate comprehensive inspection is recommended. Finally, CT may also be critical for treatment evaluation and follow-up, for which, however, further investigation is needed.

Best regards,  
Shuixing Zhang.

**Consent to participate** Not applicable.

**Consent for publication** Not applicable.

**Availability of data and material** Not applicable.

**Code availability** Not applicable.

**Authors' contributions** Not applicable.

## Compliance with ethical standards

**Conflicts of interest/competing interests** The authors declare that they have no conflict of interest.

**Ethics approval** This article does not contain any studies with human participants or animals performed by the author.

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