

CT Provides Best Diagnosis for COVID-19

- In a recent study [1] of 1,014 patients, chest CT was more effective than RT-PCR lab testing in detection of COVID-19.

- The results showed that 601 patients (59%) had positive RT-PCR results, while 888 (88%) had positive chest CT scans.

- The low sensitivity of RT-PCR implies that many COVID-19 patients may not receive appropriate treatment and risk infecting a larger population.

In a recent study [1] of more than 1,000 patients published in the journal Radiology, chest CT outperformed lab testing in the diagnosis of 2019 novel coronavirus disease (COVID-19).

Starting December 2019, a number of cases of “unknown viral pneumonia” related to a local Seafood Wholesale Market were reported in Wuhan City, Hubei Province, China [2]. A novel coronavirus (SARS-CoV-2) was suspected to be the etiology with the Phinolophus bat as the alleged origin. In just two months, the virus has spread from Wuhan to the whole China, and another 33 countries

The researchers of the recent study [1] conclude that CT should be used as the primary screening tool for COVID-19.

In the absence of specific therapeutic drugs or vaccines for COVID-19, it is essential to detect the disease at an early stage and immediately isolate an infected patient from the healthy population.

According to the latest guidelines published by the Chinese government, the diagnosis of COVID-19 must be confirmed by reverse-transcription polymerase chain reaction (RT-PCR) or gene sequencing for respiratory or blood specimens, as the key indicator for hospitalization. However, with limitations of sample collection and transportation, as well as kit performance,

the total positive rate of RT-PCR for throat swab samples has been reported to be about 30% to 60% at initial presentation.

In the current public health emergency, the low sensitivity of RT-PCR implies that a large number of COVID-19 patients won't be identified quickly and may not receive appropriate treatment. In addition, given the highly contagious nature of the virus, they carry a risk of infecting a larger population.

“... About 81% of the patients with negative RT-PCR results but positive chest CT scans were re-classified as highly likely or probable cases with COVID-19

“Early diagnosis of COVID-19 is crucial for disease treatment and control. Compared to RT-PCR, chest CT imaging may be a more reliable, practical and rapid method to diagnose and assess COVID-19, especially in the epidemic area,” the authors wrote.

Chest CT, a routine imaging tool for pneumonia diagnosis, is fast and relatively easy to perform. Recent research found that the sensitivity of CT for COVID-19 infection was 98% compared to RT-PCR sensitivity of 71%.

For the current study, researchers at Tongji Hospital in Wuhan, China, set out to investigate the diagnostic value and consistency of chest CT imaging in comparison to RT-PCR assay in COVID-19.

Included in the study were 1,014 patients who underwent both chest CT and RT-PCR tests between January 6 and February 6, 2020. With

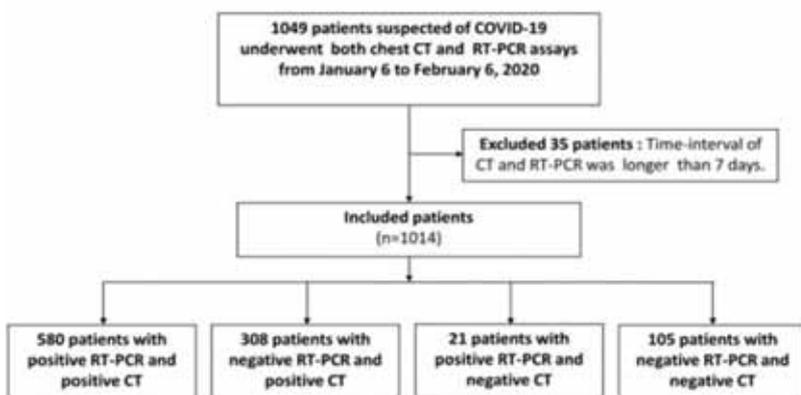
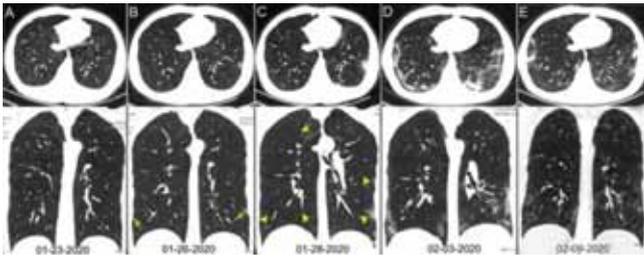


Figure 1. Flowchart of this study. RT-PCR= reverse transcription polymerase chain reaction.

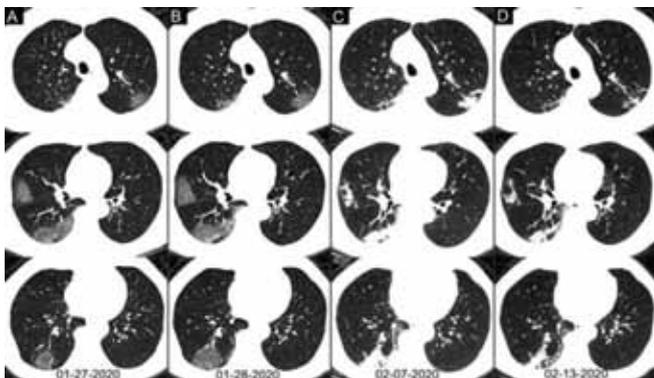


Chest CT images of a 29-year-old man with fever for 6 days. RT-PCR assay for the SARS-CoV-2 using a swab sample was performed on February 5, 2020, with a positive result. (A) Normal chest CT with axial and coronal planes was obtained at the onset. (B) Chest CT with axial and coronal planes shows minimal ground-glass opacities in the bilateral lower lung lobes (yellow arrows). (C) Chest CT with axial and coronal planes shows increased ground-glass opacities (yellow arrowheads). (D) Chest CT with axial and coronal planes shows the progression of pneumonia with mixed ground-glass opacities and linear opacities in the subpleural area. (E) Chest CT with axial and coronal planes shows the absorption of both ground-glass opacities and organizing pneumonia.

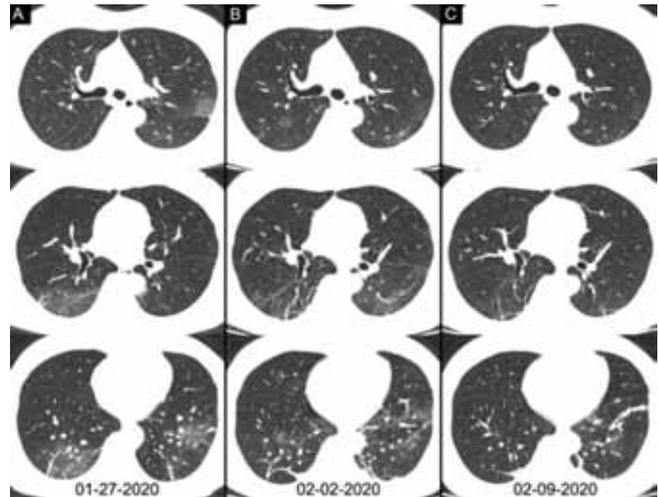
RT-PCR as reference standard, the performance of chest CT in diagnosing COVID-19 was assessed. For patients with multiple RT-PCR assays, the dynamic conversion of RT-PCR test results (negative to positive, and positive to negative, respectively) was also analyzed as compared with serial chest CT scans.

The results showed that 601 patients (59%) had positive RT-PCR results, and 888 (88%) had positive chest CT scans. The sensitivity of chest CT in suggesting COVID-19 was 97%, based on positive RT-PCR results. In patients with negative RT-PCR results, 75% (308 of 413 patients) had positive chest CT findings. Of these, 48% were considered as highly likely cases, with 33% as probable cases. By analysis of serial RT-PCR assays and CT scans, the interval between the initial negative to positive RT-PCR results was 4 to 8 days.

Discrepant results between RT-PCR and Chest CT



Chest CT images of a 62-year-old man with fever for 2 weeks, and dyspnea for 1 day. Negative results of RT-PCR assay for the SARS-CoV-2 using a swab samples were obtained on February 3 and 11, 2020, respectively. (A) Chest CT with multiple axial images shows multiple ground-glass opacities in the bilateral lungs. (B) Chest CT with multiple axial images shows enlarged multiple ground-glass opacities. (C) Chest CT with multiple axial images shows the progression of the disease from ground-glass opacities to multifocal organizing consolidation. (D) chest CT with multiple axial images shows partial absorption of the organizing consolidation



Chest CT images of a 46-year-old woman with fever for 4 days. The result of RT-PCR assay for the SARS-CoV-2 using a swab sample was positive on February 4, 2020 and was negative on February 12. Three chest CT scans obtained from (A) January 27, (B) February 2 and (C) February 09, 2020 show the gradual absorption of bilateral ground-glass opacities and linear consolidation.

“About 81% of the patients with negative RT-PCR results but positive chest CT scans were re-classified as highly likely or probable cases with COVID-19, by the comprehensive analysis of clinical symptoms, typical CT manifestations and dynamic CT follow-ups,” the authors wrote.

LIMITATIONS

There are several limitations in the present study. For example, by using RT-PCR assays with relatively low positive rate as reference, the sensitivity of chest CT for COVID-19 may be overestimated while the specificity underestimated. In epidemic area, negative RT-PCR but positive CT features can still be highly suggestive of COVID-19. This has important clinical and societal implications.

CONCLUSION

Despite the limitations of the current study, it can be concluded that chest CT imaging has high sensitivity for diagnosis of COVID-19. Our data and analysis suggest that chest CT should be considered for COVID-19 screening, comprehensive evaluation, and follow-up, especially in epidemic areas with high pre-test probability for disease.

REFERENCE

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