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Role of computed tomography imaging in identifying COVID-19 cases

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At the time of writing, more than 4.1 million cases of coronavirus disease 2019 (COVID-19) have been reported worldwide with more than 280 000 deaths.[1] The first case in Hong Kong was confirmed on 23 January 2020, and a total of 1046 cases with four deaths have been reported to date.[2] Generally, individuals with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection develop COVID-19-associated symptoms. However, similar to influenza, asymptomatic carriers of SARS-CoV-2 have been documented in affected populations such as Hong Kong,[2] Italy,[3] and China.[4]

Understanding the clinical, laboratory, and imaging characteristics of COVID-19 helps identify suspected infection.[5,6] However, in places where significant local spread of COVID-19 infection has occurred, it can be difficult to differentiate cases from other respiratory diseases with similar clinical presentation. Reverse transcription-polymerase chain reaction (RT-PCR) is the most commonly used diagnostic tool for screening for SARS-CoV-2.[7] Nevertheless, various initial (not serial) test sensitivity rates have been reported, for example 70.6% (36/51),[8] 83.3% (30/36),[9] 97.0% (162/167),[10] and 97.5% (586/601).[11] False negative results may be caused by various factors including differences in sampling of specimens in terms of temperature and time of specimen preservation.[12] False negative results produce false reassurance in patient treatment and may increase the difficulty in controlling the spread of the disease in the community. Therefore, other complementary diagnostic tools or methods may be needed to reduce false negative results. Computed tomography (CT) imaging of the chest has been suggested as the first-line imaging modality among patients who are highly suspected of SARS-CoV-2 infection with lung abnormalities.[7,10,13]

Computed tomography imaging can be used to monitor disease progress and assess the severity of disease.[10,13] Several studies had shown that specific features and differences in imaging features can help provide information on the severity of the disease. In the study by Woo et al,[14] the authors described the un-enhanced CT imaging findings of three critically ill patients with COVID-19 and all presented with consolidations in addition to the characteristic ground glass opacities with crazy paving opacities. They suggested that CT findings of consolidation may be used as prognostic factors indicating more severe disease although future larger studies are needed to confirm this postulation. A study conducted in mainland China reported ground-glass opacities in early disease, followed by crazy paving and increasing consolidations in the later course of the disease,[15] whereas others have reported a predominance of ground-glass opacification with occasional consolidation on CT.[16]

Chest CT examinations may also be useful for early screening of patients with suspected COVID-19,[7] especially among those with negative results on RT-PCR screening.[10] In this issue of *Hong Kong Medical Journal*, Kwok et al[17] describe a 63-year-old Chinese male from Wuhan, China, who presented to the emergency department and was later confirmed with COVID-19 using RT-PCR from nasopharyngeal aspirate and throat swab specimens. Although serial chest plain radiographs were negative, high-resolution CT showed characteristics of COVID-19 infection. Therefore, the authors suggested that high-resolution CT can be useful for early radiological assessment for patients with negative chest radiographs. A study conducted in Wuhan population on around 1000 patients with COVID-19 suggested that chest CT may have higher sensitivity for diagnosis when compared with RT-PCR on throat swab samples.[11] Another smaller study also reported similar findings on a consecutive 51 patients,[8] and a case series in this issue of *Hong Kong Medical Journal* found that chest CT had a low rate of misdiagnosis of COVID-19.[14]

Most published studies include a small number of patients. Nevertheless, the radiological characteristics of patients with COVID-19 described above suggest that chest CT may be useful as a complement to RT-PCR tests, especially when the diagnosis is in doubt. However, before one can recommend chest CT as the main screening modality for diagnosing COVID-19, several factors would need to be considered. First as a screening modality, the test should be simple and with good accessibility.

The cost and availability of CT examinations for diagnosis would likely be a significant limiting factor for its use and access in different health systems. Second, we still need more information on the radiological features associated with the natural disease course of COVID-19, such that we can be certain that patients can be diagnosed early and timely with CT in the disease course. Finally, we need to further characterise the radiological features of chest CT among asymptomatic carriers who are suspected to have history of disease exposure. Upon data availability, chest CT will be more useful as an aid to RT-PCR testing in clinical situation where the diagnosis is uncertain.

Author contributions

All authors contributed to the concept or design of the study, drafting of the manuscript, and critical revision of the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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