



The role of CT for Covid-19 patient's management remains poorly defined

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In December 2019, the 2019 novel coronavirus (2019-nCoV) was identified in the viral pneumonia cases occurred in Wuhan, Hubei Province, China; In the following month, the 2019-nCoV quickly spread inside and outside of Hubei Province and even to other countries. Respiratory droplet transmission is the main route of transmission, while it can also be transmitted through contact. Based on currently epidemiological survey, the latency period is mostly from 0 to 10 days (median: 3 days), though much longer incubation period cases have been noted (1-4). 2019-nCoV is also contagious during the latency period. The time span of the patients discharging infective virus is not clear. Covid-19 patients commonly have symptoms of fever, fatigue, dry cough, dyspnoea, chest tightness, nasal congestion, runny nose or other upper respiratory symptoms. In the early stage of the disease, the total number of leukocytes may decrease or remain normal, with lowered lymphocyte count or increased or normal monocytes. C-reactive protein and D-dimer may increase (1-3). The population is generally susceptible to the virus. The elderly and those with underlying diseases may be more seriously affected after infection (2,3). From current knowledge of the cases, most patients have a good prognosis, and a small portion of patients can have critical condition (1,2,5). Death cases (currently estimated to be 2%, and lower in regions other than Wuhan/Hubei) are more frequently seen in the elderly and those with chronic underlying diseases (1,3,5).

According to current recommendation, in non-Wuhan/

non-Hubei regions, persons with close contacts and suspicious exposure are advised to have a 14-day health observation period. Contact surveillance should be carried out for those who had exposed to accidental contact, low-level exposure to suspected or confirmed patients (1,2,4). Once they display any symptoms, especially fever, respiratory symptoms such as coughing, shortness of breath, or diarrhoea, they should seek medical attention immediately. Suspected cases are those with epidemiologic risk and with clinical features (1,2). Confirmed cases are diagnosed with pathogenic evidence of (I) positive for the 2019-nCoV by the real-time PCR test for nucleic acid in respiratory or blood samples; or (II) viral gene sequencing shows high homogeneity to the known 2019-nCoV in respiratory or blood samples.

Recently, CT has been advocated and widely applied in Covid-19 clinical management, including for child subjects (5-9). Typical chest imaging manifestations are reported to include multiple, patchy, sub-segmental or segmental ground glass density shadows in both lungs (1), though atypical findings are increasingly common. However, hereby we hope to reiterate that while CT radiation is associated with nonnegligible oncogenic risk (10,11), till now the role of CT for Covid-19 patients care remains poorly defined. Currently there is no effective anti-viral treatment or vaccine for 2019-nCoV (1). This is different to the cases of pulmonary tuberculosis. For tuberculosis, after a clinical diagnosis aided with imaging is made, anti-tuberculosis treatment can be initiated even without positive pathogenic

diagnosis of *Mycobacterium tuberculosis* smear or culture. For cases of Covid-19, CT may show signs typical of viral pneumonia, and thus help the clinical diagnose. However, a shift from a suspected case designation to a clinically diagnosed Covid-19 case designation may not impact the clinical management.

Covid-19 suspected case should be isolated, and supportive treatments offered. Covid-19 patients are classified into (I) asymptomatic infection (II) acute upper respiratory tract infection (III) mild pneumonia, (IV) severe pneumonia, and (V) critical cases (1,2). The supportive treatments are primarily based on the severity of clinical symptoms/signs. For severe and critical cases, hematological and biochemical parameters are monitored. CXR (chest X-ray) can be performed to watch the progression or regression of pulmonary lesions (12). There may be a chance that CXR can help early identification of critical cases, with imaging features of bilateral or multi-lobe infiltration, or rapid progression of conditions during a very short period (1).

For the initial disease detection, it should be noted that in about 25% cases of Covid-19, chest CT can be negative (5) (We except this CT negative rate will be substantially higher when more milder cases are examined in the future). A one-time negative chest CT does not rule out Covid-19. CXR is likely to miss some patients with less substantial ground glass opacities. However, with this limitation known, a negative CXR also does not rule out the diagnosis of Covid-19 and the patient will be further monitored. The severity of lung changes visible on imaging is mostly related to the severity of the disease itself (5). For these CXR missed milder cases, if CT is applied and lesions are detected, the clinical treatment management would remain the same; as all suspected patients should be isolated and monitored. The management might be different if an effective anti-viral treatment is found, such as if Remdesivir is proven to be effective for Covid-19, then likely a clinical diagnosis based on epidemiological risk factor, clinical symptoms and typical CT manifestation of viral pneumonia may warrant Remdesivir administration (12).

While a CXR delivers a radiation dosage of around 0.05 mSv, a standard chest CT may deliver around 4–7 mSv. It was estimated that one CT scan may be associated with an oncogenic risk of 0.05–0.7%. For patients had multiple CT scans, the risk can be as high as >2.7% (13–15). Moreover, CT scan would incur procedure-induced virus transmission. Also, CT findings can only suggest pneumonia diagnosis. If false CT positive patients i.e., pneumonia patients of causes

other than 2019-nCoV, are hospitalized in wards close to Covid-19 patients, there is an additional risk of hospital-based transmission. In one study in Wuhan, hospital-related transmission of 2019-nCoV was suspected in 41% of patients (3); though this can be improved with more precautions.

CT may be useful for some scenarios. Using CT to detect Covid-19 pneumonia may be justified in areas such as Wuhan/Hubei, where the healthcare is currently stretched, and management priority are given to confirmed or clinically diagnosed Covid-19 patients. According to the current guideline, after the body temperature returned to normal for more than 3 days; respiratory symptoms improved significantly; inflammation of the lungs showed obvious signs of absorption; and respiratory nucleic acid was negative for two consecutive times (one-day sampling time interval at least); the patient can be released from isolation (1,2). Upon further studies, we would expect CT may play a role for deciding when patient can be discharged from isolation. We also expect that CT may be applied in some selected suspected cases where pathogenic tests have been negative more than once, and if CT would show findings consistent with viral pneumonia, specific measures can be taken, such as even stricter isolation according to region-specific guidelines (so to control potential virus transmitter cases).

In conclusion, currently there is no specific targeted treatment or vaccine for Covid-19. The approach to this disease is to control the source of infection; use of personal protection and precaution to reduce the risk of transmission; and early isolation and supportive treatments for affected patients. The role of CT in Covid-19 patient's management course remains undefined and its application as a diagnostic tool may be unjustified among regions with low Covid-19 prevalence (low pre-CT test probability). In all cases, we need to keep patients' exposure to radiation as low as possible. Particularly, children should avoid CT examination as much as possible. Children are much more sensitive than adults to the induction of cancer by radiation (10,16), and ultrasound imaging can be an alternative to techniques associated with radiation (17,18). CXR can be the choice for imaging, particularly for serial monitoring, as demonstrated in the case report from USA (12). For CT examinations, low radiation dose mode and techniques to minimise the radiation dosage should always be applied (13,19). There may be no ideal solution to all the concerns, the approach offering the best benefit-risk ratio shall prevail.

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Footnote

Conflicts of Interests: The authors have no conflicts of interest to declare.

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