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The Role of Repeat Chest CT Scan in the COVID-19 Pandemic

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The time course of chest computed tomography (CT) scan changes during recovery from COVID-19 has been described (1). Previous studies using repeat chest CT scans have shown that different stages could be presumed for changes in CT scan findings (2). In the early course of COVID-19 pneumonia, pulmonary CT scans could either be normal or show subtle findings. The initial CT findings in patients include bilateral, multilobar ground glass opacification with a peripheral or posterior distribution, most commonly in the lower lobes and less frequently in the middle lobe. These changes mainly occur during the early stage of disease, which is 0–4 days after the onset of initial symptoms (3). In the progressive stage (days 5–8), crazy-paving pattern, extension of ground glass opacification, and the initial development of consolidation are the main radiologic features on CT. In the peak stage (days 9–13), dense consolidations become more prevalent and the air bronchogram sign is seen more commonly. Finally, in the absorption stage (14 days or more after the onset of initial symptoms) after the patients have recovered and the infection is controlled, consolidations gradually absorb. No crazy paving is evident at this stage, while fibrotic streaks, tractional bronchiectasis, bronchus distortion, and subpleural fibrotic lines become more prominent (2).

Recently, the Fleischner Society published a consensus about the role of chest imaging (mainly CT scan) in patient management during the COVID-19 pandemic and discussed different clinical scenarios, including the severity of respiratory disease, pretest probability, risk factors for disease progression, and critical resource constraints. The results were then aggregated, resulting in recommendations intended to

provide guidance for medical practitioners in the use of CXR and CT in COVID-19 management (4). They clearly stated the indications of using chest imaging during the COVID-19 pandemic; however, as far as we are concerned, there is currently no general consensus regarding the role of repeat chest imaging (CT scan) in patients suspected, diagnosed or treated as COVID-19.

In February 2020, with the increasing number of cases diagnosed with the novel COVID-19 and the fear of a serious outbreak in Iran, a central committee was established on behalf of the Iranian Radiology Society to provide consultations for physicians dealing with known or suspected cases of COVID-19. To reach this goal, the radiologic imaging (including both chest X-ray and chest CT scan) of all patients are collected from across the country and sent to this group via social media or Picture Archiving and Communication system. After interpretation of the imaging findings by a group of experienced academic radiologists (Iranian Society of Radiology COVID-19 Consultant Group), reports are integrated to reach a final conclusion (5,6). Until now, we have offered consultation on more than 3000 chest imaging reports from COVID-suspected patients.

According to our experience during the last 2 months of disease outbreak in Iran, we observed that some patients may benefit from repeat CT scan; however, number of repeat chest CT scan should be minimized and we need local expert consensus regarding indications of repeat chest CT scan in each health care system. Herein, we propose some of the potential indications for repeat CT scan in the COVID-19 pandemic. Note that these proposed indications should be approved in larger global consensus before routine clinical use:

- 1- Worsening of respiratory symptoms in outpatients or hospitalized patients: The natural course of COVID-19 pneumonia varies greatly from patient to patient; occasionally during patient management we are confronted with worsening of the respiratory status of patients or treatment resistant hypoxia lasting for few days. Clearly, in addition to clinical and laboratory examinations, repeat chest CT could be very helpful in searching for complications of COVID-19 pneumonia (7). Also signs and symptoms of suspected pulmonary emboli or superimposed bacterial infection could be a proper indication to repeat chest CT scan.
- 2- Patients clinically suspected to have moderate-to-severe COVID-19 infection with negative RT-PCR results and normal or subtle nonspecific findings on initial chest CT scan: Due to the low sensitivity of the time-consuming PCR test, patients who have moderate-to-severe symptoms but a normal chest CT scan, which is not unusual in the first 4 days of the disease, could benefit from repeat CT scan after 4 days from symptom onset (8). Such patients include elective surgery candidates, cancer patients

who are waiting for chemoradiation therapy, and those who need to be quarantined as soon as possible.

- 3- High-risk hospitalized patients with comorbidities, such as malignancies, need close observation to detect early changes, which may require advanced health care support, such as an ICU admission, due to the high mortality rates in these patients. We proposed that a timely repeat chest CT scan may be beneficial in these high-risk patient groups.
- 4- Post-treatment and postquarantine: We believe that chest CT scans could be helpful in evaluating pulmonary complications in recovered individuals.
- 5- Assessment of treatment response: Long-term repeat chest CT scans should be considered in clinical trials of patients treated with off-label drugs.
- 6- Inconsistency between clinical symptoms and imaging findings: Repeat chest CT could be helpful in investigating other comorbidities or complications.
- 7- Individuals with a compromised immune system: Recent data has shown that these patients might be subject to a longer incubation period and thus, performing a repeat chest CT scan might be useful before considering the use of invasive therapies (9).

- 8- Research purposes: For the follow-up of post-COVID infection complications and patients' pulmonary status.

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