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Follow-up computed tomography scan in post-COVID-19 pneumonia

Chohan A *et al*. Follow-up CT scan in post COVID-19

Abstract

The coronavirus disease 2019 (COVID-19) global pandemic can be a severe illness that leads to morbidity and mortality. With the increasing number of COVID-19 pneumonia survivors, several long-term changes may persist, including abnormal imaging of lung parenchyma. In addition to the clinical course, it is vital to follow up on pulmonary imaging during the post-infectious period, which is not routinely required in other common pulmonary diagnoses. Computed tomography (CT) scan of the chest is an effective and diagnostic tool for pneumonia which gives an insight into structural abnormalities within the lungs, complications, and possible progression of the disease. Several studies have monitored COVID-19 pneumonia and its complications using serial CT chest imaging from the initial phase of infection, hospitalization, and post-discharge. Nonetheless, long-term follow-up imaging data in post-COVID-19 is still limited. We have summarized the findings utilizing a systematic review of the literature regarding COVID-19 pneumonia imaging, including long-term follow-up.

Key Words: COVID-19; Pneumonia; Computed tomography; Evolution; Progression

Chohan A, Choudhury S, Dadhwal R, Vakil AP, Franco R, Taweesedt PT. Follow-up computed tomography scan in post-COVID-19 pneumonia. *World J Radiol* 2022; In press

Core Tip: Changes seen in computed tomography imaging related to coronavirus disease 2019 (COVID-19) pneumonia appear to progress and peak around two weeks post-hospitalization. Overall improvement and complete resolution of COVID-19 pneumonia-related changes imaging can be seen in the majority of the patients with long-term follow-up. We have summarized the findings utilizing a systematic review of the literature regarding COVID-19 pneumonia imaging, including long-term follow-up.

TO THE EDITOR

We read the article titled "Review on radiological evolution of COVID-19 pneumonia using computed tomography" by Casartelli *et al*[1] with keen interest. A chest computed tomography (CT) scan can be a useful diagnostic tool in a high-prevalence or pandemic situation, especially with clinical correlation. Risk stratification and assessing the progression of disease are also effective uses of CT chest imaging in coronavirus disease 2019 (COVID-19) patients. Given the global spread of COVID-19 and the magnitude of both direct and indirect effects of the disease, a CT scan of the chest can help in long-term prognostication in patients who survive.

Multiple studies have concluded that with disease progression, certain initial CT findings in COVID-19 can evolve with a specific pattern and regularity. COVID-19 pneumonia-related changes seen on CT chest imaging typically progress rapidly, plateau, and subsequently start to resolve thereafter. Changes in CT imaging vary widely from six to seventeen days but typically stabilize within the first two weeks of COVID-19 pneumonia. In the short term, some of the features seem to recur, with scans mostly showing consolidations and ground-glass opacities (GGO). Besides GGO, chest CT characteristics that indicate the reparation, including subpleural, linear opacities, and fibrotic changes, were also reported. A sign termed "fishing net on trees" has also been reported. Some reports have also mentioned interseptal thickening and fibrous streaks[1,2]. Three weeks post-discharge, GGO and fibrous stripes have been seen, while after four weeks, mostly linear opacities remained. The "tinted" sign and bronchovascular bundle distortion have also been mentioned. The bronchovascular bundle distortion could possibly be a result of inflammatory destruction or subsegmental atelectasis. The latter two signs mentioned above may signify the gradual resolution of inflammation with re-expansion of alveoli based on previous reports. This review included reports with follow-up durations of up to four months[1].

In a study conducted by Pan *et al*[3], two hundred nine patients with COVID-19 infection, who had been admitted to the hospital, undertook serial chest CT at three, seven, and twelve months. One-year CT chest follow-up revealed residual linear lesions, multiple areas of reticular opacities/cysts, and complete resolution in 12%, 13%,

and 75%, respectively[3]. In another study conducted by Guan *et al*[4], CT results of 69 patients who had COVID-19 infection were assessed in three different phases: Initial CT, peak CT, and CT prior to discharge. Peak CT in this study was the highest attenuation of the density without alteration in size during COVID-19 progression or the maximal size of lesion on CT which is the most common pattern. The intervals were closely correlated to lobe scores and CT appearances; the higher the lobe score, the longer the intervals. The lobe score was calculated according to the percentage of the lesion in one lobe with the zero equals to no lesion, one equals more than 0% to less than 25%, two equals 25% to less than 50%, three equals 50% to less than 75%, and four equals to 75% or more. While the utilization of lobe score may be beneficial, further studies are necessary to assess its effectiveness on a larger scale.

The duration of initial interval is inversely correlated with the amount of consolidations, air bronchograms, and irregular lines[3]. The intervals will be longer if irregular and reticular lines are seen on the peak CT and pre-discharge CT. After that, COVID-19 pneumonia lesions on the CT chest may resolve completely, while GGO, irregular and reticular lines may remain[3]. In a similar study conducted by Chen *et al*[5], 41 patients were followed with chest CT during the hospital stay and at two weeks, one month, three months, six months, and one year after discharge. The study concluded that patients showed continuous improvement on lung CT scans during the 1-year follow-up time; however residual lesions (GGO and reticular patterns) may still be found, which are associated with lung volume parameters and risk of developing lung opacities[5]. Liu *et al*[6] retrospectively evaluated chest CT follow-ups on 51 patients with COVID-19 performed on the day prior to discharge, two weeks post-discharge, and four weeks post-discharge. The results of this study indicated that changes seen were significantly reduced, including density reduction on follow-up scans as compared to the scans done at the time of discharge.

Unlike the systematic review by Casartelli *et al*[1], these results showed that 64.7% of discharged patients progressed to complete resolution of previously seen lung lesions at 4-wk follow-up, indicating that damaged lung tissue could heal in patients with

COVID-19 pneumonia[5]. In another study conducted by Liu *et al*[7], 41 patients diagnosed with COVID-19 were followed up after seven months with chest CT and cardiopulmonary exercise testing. The predominant chest CT patterns at seven months included parenchymal bands (41%), interlobular septal thickening (32%), and traction bronchiectasis (29%). Sixty-one percent of the patients achieved complete radiological resolution, while 29% went on to develop pulmonary fibrosis. Those patients who went on to develop fibrotic lung disease appeared to have an increased risk due to older age and comorbid conditions[7].

While CT scan of the chest is an effective tool in COVID 19 patients, the side effects to patients of repeat irradiation need to be kept in mind and the use of low dose CT to follow up these patients can be considered. In conclusion, CT scans of the chest are an effective diagnostic tool which can provide insight into the structural pathology of pulmonary disease, its progression, and its association with long-term effects. Future studies should be utilized to define its utility in determining long-term progression in patients with COVID-19 pneumonia.

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