



New CT finding (the target sign) in three patients with COVID-19 pneumonia

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TO THE EDITOR:

In December of 2019, the city of Wuhan, in Hubei province, China, became the epicenter of an outbreak of pneumonia caused by a new coronavirus, which was later designated SARS-Cov-2 by the World Health Organization, the disease caused by SARS-Cov-2 being designated COVID-19. COVID-19 was declared a global public health emergency by the World Health Organization on January 30, 2020.⁽¹⁾ COVID-19 is diagnosed by positive RT-PCR testing on nasopharyngeal aspirates or lower respiratory tract secretions (sputum, tracheal lavage fluid, or bronchoalveolar lavage fluid). However, because RT-PCR results can be delayed or false negative, chest CT has become an important diagnostic aid, being strongly recommended in suspected cases of COVID-19.⁽²⁾

The clinical expression of COVID-19 is variable, including mild, moderate, severe, and critical disease. The initial clinical presentation includes fever and flu-like symptoms, which can gradually progress to dyspnea and respiratory failure in 7-14 days.⁽³⁾

Chest CT findings are well established and, like the clinical expression of COVID-19, are variable, being consistent with the temporal progression of the disease.^(4,5) The most commonly reported CT findings in patients in the early stages of COVID-19 are nodular/patchy, single/multiple ground-glass opacities in a peripheral/peribronchovascular distribution, as well as intralobular/interlobular septal thickening, together with a crazy-paving pattern. In the progressive phase, the number of lesions increases, as does their size and density, generally coexisting with ground-glass opacities, consolidations, and, in some cases, bronchiectasis and atelectasis. In the severe phase, all lung segments are affected, and atelectasis is present. In the healing (or dissipation) phase, cord-like opacities appear, indicating fibrosis. COVID-19 can have a short clinical course, with early imaging findings rapidly progressing to findings consistent with the healing phase of the disease.

Several chest CT scan signs have been described in patients with COVID-19 pneumonia,⁽⁶⁾ including the batwing sign, representing bilateral perihilar opacities, the white lung sign, representing diffuse, high-density opacities, the *Rosa roxburghii* sign, representing focal nodular ground-glass opacities, the gypsum sign, representing patchy consolidations of varying density in both lungs, and the reversed halo sign, which is defined as a focal area of ground-glass opacity surrounded by

a ring of consolidation and which has been shown to be associated with several infectious and noninfectious diseases,⁽⁷⁾ including viral pneumonia.⁽⁸⁾

In three RT-PCR-confirmed COVID-19 patients undergoing HRCT at our facility, ground-glass opacities or peripheral curvilinear consolidative opacities were found in the secondary pulmonary lobule, together with central nodular opacity (corresponding to a perilobular pattern with central involvement in the secondary pulmonary lobule) surrounding the centrilobular arteriole, giving an appearance similar to that of a shooting target.

Patient 1 was a 36-year-old man who was admitted with severe dyspnea. He underwent HRCT 11 days after the onset of symptoms. The findings included ground-glass opacities and target signs in the lower lobes (Figure 1A). Patient 2 was a 43-year-old woman who was admitted with an 8-day history of dry cough and chills. She underwent HRCT 10 days after the onset of symptoms. The findings included bilateral target signs in the lower lobes (Figure 1B). Patient 3 was a 42-year-old woman who was admitted with a 7-day history of productive cough, rhinorrhea, and odynophagia. HRCT findings included target signs in the lower lobes (Figures 1C and 1D).

The finding of perilobular opacity associated with central nodular opacity in the secondary pulmonary lobule on chest CT scans of patients with COVID-19 was first reported in a study published in June of 2020⁽⁹⁾ and was designated the target sign. According to the authors of the study,⁽⁹⁾ a perilobular pattern and the reversed halo sign are indicative of organizing pneumonia in patients with COVID-19; also according to the authors, in COVID-19 patients presenting with the target sign, the peripheral opacities are suggestive of organizing pneumonia, whereas the central nodular opacity is suggestive of vascular and perivascular inflammation or focal enlargement of the pulmonary artery. We suggest the possibility of organizing pneumonia involving the periphery and the center of the secondary pulmonary lobule, given that organizing pneumonia can present with peribronchovascular involvement.⁽¹⁰⁾

To our knowledge, the target sign has not been described before in viral or bacterial respiratory infections and could be a hallmark of COVID-19 pneumonia, given the appropriate clinical context. However, in order to determine that, there is a need for studies comparing CT findings of COVID-19 pneumonia with those of other types of pneumonia and those of other diseases that can present with organizing pneumonia.

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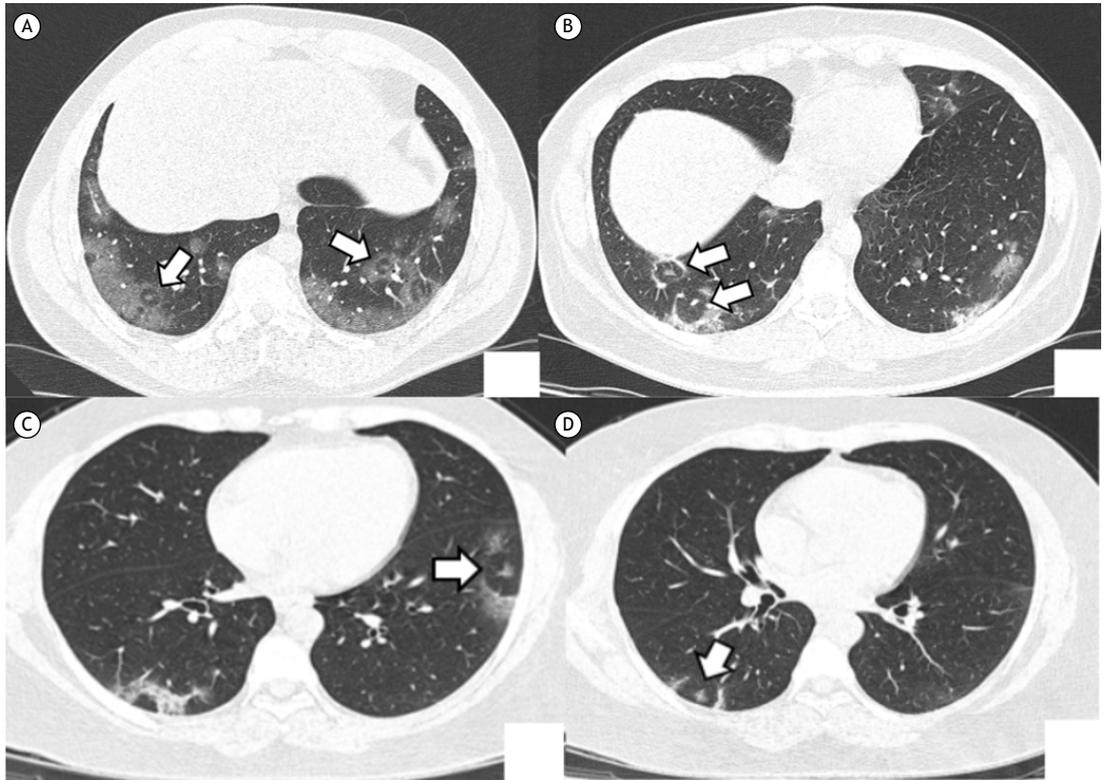


Figure 1. Axial HRCT scans of patients with COVID-19 pneumonia, showing bilateral ground-glass opacities containing lesions at the lung bases (the target sign, arrows).

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