



Is the CT target sign specific to COVID-19 pneumonia?

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We read with interest the letter to the editor by Martins et al.,⁽¹⁾ who reported the cases of three RT-PCR-confirmed COVID-19 patients presenting with the target sign, a recently described chest CT finding in COVID-19.

In a series of nearly simultaneous studies,⁽²⁻⁵⁾ the target sign has been described as a new CT finding in patients with COVID-19, consisting of central nodular opacity surrounded by a dense peripheral rim. The sign has variously been termed the target sign,^(2,4) the "double halo" sign,⁽³⁾ and the "bullseye" sign.⁽⁵⁾ However, the target sign appears to be the most appropriate and widely accepted term to describe it^(2,4,6) because of its peculiar appearance, similar to that of a shooting target.

Careful analysis of CT findings in COVID-19 patients presenting with the target sign shows that the sign represents central nodular opacity of variable density (soft-tissue density or ground-glass density), surrounded by a less dense rim (of normal parenchyma or ground-glass

opacity), which in turn is surrounded by a denser peripheral rim (of ground-glass density or soft-tissue density). In some cases, multiple concentric ring-like opacities are seen.⁽⁶⁾

A review of the literature⁽¹⁻⁶⁾ shows that the densities of the central and peripheral opacities vary across cases; in some cases, the center has soft-tissue density, whereas, in others, it has ground-glass density. One study⁽⁵⁾ showed that there can be an "inner ring of air" (corresponding to normal parenchyma) between the central nodular opacity and the dense peripheral rim. This is consistent with some of our own findings (Figures 1A and 1B).

The target sign has been confused with the reversed halo sign (RHS), despite the fact that they can be differentiated by morphological criteria. The RHS is also seen in patients with COVID-19 and is a nonspecific sign, having been shown to be associated with several infectious and noninfectious diseases.⁽⁷⁾ It has recently been shown

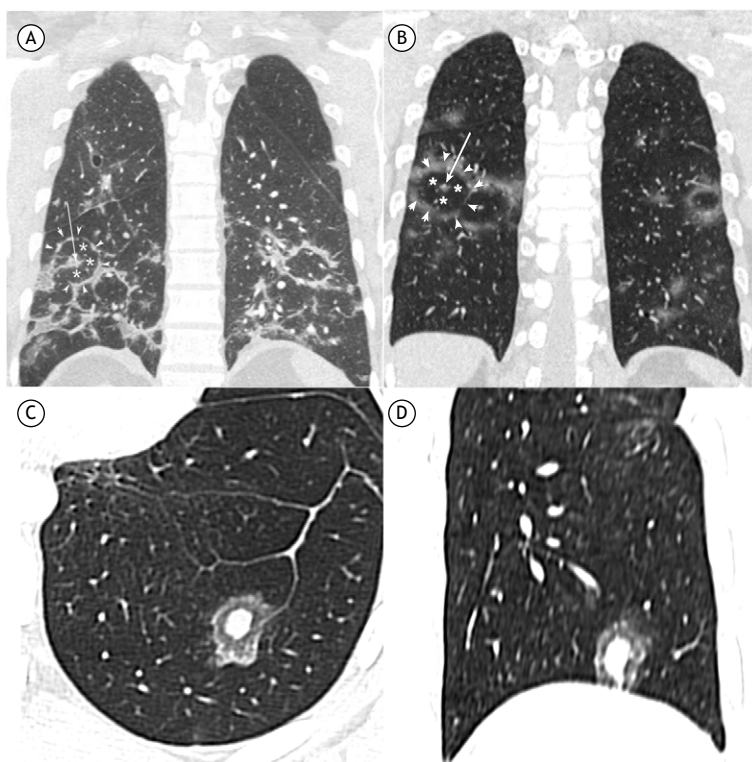


Figure 1. In A and B, coronal CT scans of two different patients with confirmed COVID-19, showing perilobular opacities and imaging findings consistent with the target sign, including central nodular opacity (arrows), a dense peripheral rim (arrowheads), and an inner ring suggestive of normal lung parenchyma (asterisks). In C and D, chest CT scans of a patient with pulmonary osteosarcoma metastasis, showing similar imaging findings, including central nodular opacity surrounded by two concentric ring-like opacities of low density.

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that patients with COVID-19 can present with either an RHS,⁽⁸⁾ which is defined as a focal rounded area of ground-glass opacity surrounded by a more or less complete ring of consolidation,⁽⁹⁾ or a reticular RHS, which is an RHS with low-attenuation areas within the halo, with or without reticulation, suggestive of pulmonary infarction.⁽¹⁰⁾

Although for the sake of scientific rigor it is important to differentiate between the two, they both indicate organizing pneumonia in patients with COVID-19.⁽¹¹⁾

According to Martins et al.,⁽¹⁾ the target sign has not been described before in viral or bacterial respiratory infections and could be a hallmark of COVID-19 pneumonia in the appropriate clinical context. 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.⁽¹⁾

Following this line of reasoning, we report the case of a 16-year-old male patient who presented with a

typical target sign on chest CT, with no relation to COVID-19 or organizing pneumonia. The patient was admitted with a tumor in the right femur. The tumor was resected, and the histopathological diagnosis was osteosarcoma. The patient underwent chemotherapy. After 3 months, the disease progressed with multiple nodular opacities in the lungs; one of the opacities was a soft-tissue density nodule located in the left lower lobe and surrounded by two concentric ring-like opacities of low density, characterizing the target sign (Figures 1C and 1D). A new CT scan, performed 2 months later, showed an increase in nodule diameter, as well as the target sign. Diagnostic resection of one of the lesions followed by pathological analysis revealed osteosarcoma metastasis. The lesions progressed, and the patient died 13 months after being diagnosed with a femoral tumor.

Therefore, we sought to show that the target sign is not specific to COVID-19 and can be seen in conditions other than organizing pneumonia, including osteosarcoma metastasis.

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