Radiology Signs: The Galaxy Sign

**Dres. Rodrigo Araya R(1), Gonzalo Pérez O(1), Devis Castro C(1), Felipe Sánchez T(2), Juan Carlos Díaz P(3), Vivianne Agar F(4).**

1. Radiology, Imaging Center Hospital Clínico Universidad de Chile. Santiago, Chile.
2. Radiology, Universidad de los Andes. Santiago, Chile.

**Abstract:** The galaxy sign represents a mass-like lesion, composed of innumerable coalescing granulomatous nodules, more concentrated in the center than at the periphery. It was initially described in patients with sarcoidosis, and was referred to as the “sarcoid galaxy” sign. It is now known to be present in other entities such as tuberculosis, lung cancer and the pulmonary fibrosis mass of pneumoconiosis. Its identification and adequate interpretation is important, given that in association with other tomographic signs it allows an orientation toward the diagnosis of sarcoidosis.

**Keywords:** Granuloma, Sarcoidosis, Tuberculosis.

**Resumen:** El signo de la galaxia representa una lesión tipo masa, compuesta por innumerables nódulos granulomatosos coalescentes, más concentrados en el centro que en la periferia. Inicialmente se describió en paciente con sarcoidosis, y se denominó el signo de la galaxia sarcoidea. Actualmente se sabe que puede estar presente en otras entidades como la tuberculosis, el cáncer pulmonar y la fibrosis pulmonar masiva de las neumoconiosis. Es importante su identificación y adecuada interpretación, dado que en asociación con otros signos tomográficos permite una orientación al diagnóstico de sarcoidosis.

**Palabras clave:** Granulomas, Sarcoidosis, Tuberculosis.


Contact: Rodrigo Araya R. / araya.rj@hotmail.com

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**Historical Review**

In 2002 a descriptive study focused on identifying common characteristics for large pulmonary nodules observed occasionally in sarcoidosis, was published. Until that time characteristics of the small nodules that typically occur in it were well known, but there were no detailed descriptions of nodules larger than 1 cm (defined as large nodules). In that study, all patients with an histological diagnosis of sarcoidosis and CT images, were retrospectively studied and all their nodules analyzed. It was reported that the structure of all the large pulmonary nodules found resembled the image of a galaxy, defined as the “conjunction of numerous stars”. This was described by the authors as “the sarcoid galaxy sign”(1).

**Imaging appearance**

This sign corresponds to an irregular central nodule, formed by the confluence of multiple smaller nodules that are less concentrated in the periphery which generates an irregular edge with multiple satellite images (Figure 1). The average size of the nodules is 1 to 2 cm(3).

**Figure 1.** a) Globular cluster M92 in the Hercules constellation. b) Computed Axial tomography slice of the chest. In the left upper lobe a central nodule can be observed with other marginalized peripheral smaller nodules, consistent with the galaxy sign.
Significance

The galaxy sign represents a conglomerate of granulomas within the lung interstitium which become inseparable and that are less concentrated in the periphery\(^{(1,2)}\).

Differential diagnosis

While this sign was first described in pulmonary sarcoidosis, currently it is considered less specific as a unique element, as other granulomatous diseases are described in the literature that develop it, especially pulmonary tuberculosis\(^{(2)}\). It can also be confused radiologically with lung cancer and progressive massive fibrosis\(^{(3)}\).

Discussion

The galaxy sign histopathologically depicts a conglomeration of interstitial granulomas that may be present both in sarcoidosis as well as in patients with tuberculosis. What helps to guide the differential diagnosis are the associated imaging findings. In sarcoidosis a bilateral and multiple distribution of the sign is observed, with symmetrical involvement in all lung lobes (Figure 2). The presence of extensive hilar-mediastinal lymphadenopathies, which can calcify in 95% of sarcoidosis are observed, so they are therefore highly suggestive of the diagnosis\(^{(1,3,4)}\). Peribronchovascular sarcoid granulomas produce irregular thickening of the bronchoarterial bundle, which is also an indicator of sarcoidosis\(^{(4)}\).

In 2005, the presence of a “cluster of small nodules” greater than 1 cm that was indistinguishable from the sarcoid galaxy reported previously\(^{(2)}\), was reported in 8 patients with active tuberculosis. In this study it was concluded that the conglomerate did not correspond to tuberculomas or scattered endobronchial nodules, and based on the granulomatous origin of the tuberculosis and sarcoidosis a common histology was suggested. The sign appeared isolated in 4 of the 8 cases and the majority was located in the upper lobes or the upper segment of the lower lobe. Only one presented hilar or mediastinal lymphadenopathy. Therefore, the single galaxy sign is more suggestive of tuberculosis, in the upper lobes with “tree-in-bud” and without the presence of lymphadenopathy\(^{(2,3)}\).

In the same series, all the “clusters of small nodules” were resolved with TB treatment and 50% of the cases had no CT findings of disease activity such as “tree-in-bud”, bronchial thickening or centrilobular nodules. It would therefore also be important to consider that the galaxy sign in patients with tuberculosis would be an individual activity indicator\(^{(2,3)}\).

Satellite nodules at the periphery of the central node can give the impression that they are fused and therefore look like spiculations, which are characteristic of the peritumoral fibrosis in lung cancer. However, lung cancer less than 3 cm, which is the usual size reported in the sarcoid galaxy, has a low incidence of mediastinal and hilar lymphadenopathy\(^{(5)}\). Therefore, the presence of extensive hilar and mediastinal lymphadenopathies and especially calcified, is more suggestive of sarcoidosis.

Figure 2. Patient diagnosed with pulmonary sarcoidosis. Computed Axial tomography slices of the chest. a, b) in the lung window, bilateral conglomerates of pulmonary nodules with a galaxy appearance, can be observed. Also observed is a thickening of the peribroncovascular axial interstitium associated with perilymphatic distributed nodes. c) The mediastinal window shows the presence of calcified bilateral hilar and subcarinal (mediastinal) lymphadenopathies.
The galaxy sign can be present in the progressive massive fibrosis of pneumoconiosis, especially silicosis and the coal workers disease\(^1,3,4\). In these cases it corresponds to clusters of silicotic nodules associated with dense fibrous and scarred tissue. To make a differential diagnosis, clinical exposure records as well as imaging is essential, where the presence of large opacities and irregularities greater than 1 cm are characteristic, bilateral, parahilar in the upper lobes or middle lobe, with decreased volume and lung architectural distortion, traction bronchiectasis, paracicatricial emphysema and perilymphatic distributed nodes. Also presents calcified mediastinal lymphadenopathies (Figure 3).

**Conclusion**

The galaxy sign is a useful tomographic sign for the diagnosis of pulmonary sarcoidosis if it is associated to the characteristic imaging findings. It is very important in the differential diagnosis of tuberculosis and neoplasia for the therapeutic and prognostic implications involved.

**Figure 3.** Pulmonary silicosis with progressive massive fibrosis. a, b) Axial and Coronal computed tomography slices of the chest in lung window, large opacities are observed and irregular perihilar in both upper lobes representing the expansion and confluence of the silicotic nodules, associated with perilymphatic nodules. c) Calcified hilar and mediastinal lymphadenopathy, some have calcification in the periphery, giving an eggshell appearance, which is suggestive but not specific for silicosis. Pleural effusion had another etiology in this case.

**Bibliography**