

The “Galaxy Sign” in Lung Cancer Screening: A Benign Mimic of Malignancy

Rohan Aggarwal¹, Gagandeep Aulakh¹, Mir Rahman¹, Mazhar Chaudri¹, Asif Azam¹

¹. Respiratory Medicine, Dudley Group NHS Foundation Trust, Russells Hall Hospital, Dudley, GBR

Corresponding author: Rohan Aggarwal, rohan.aggarwal@nhs.net

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Abstract

The “galaxy sign” is a distinctive radiologic pattern characterized by a central confluent pulmonary opacity surrounded by smaller satellite nodules, most commonly associated with sarcoidosis, among other granulomatous and inflammatory conditions. Recognition of this finding is important in lung cancer screening populations, where indeterminate nodules may prompt concern for malignancy. A 69-year-old ex-smoker underwent low-dose CT screening, which demonstrated a 60 mm cluster of dense nodules with a central 20 mm focus in the left upper lobe. Fluorodeoxyglucose (FDG) PET showed mild uptake (SUVmax 3.1) within the lesion and symmetrical, FDG-avid mediastinal and hilar lymphadenopathy (SUVmax 12.5). Endobronchial ultrasound-guided biopsy of a mediastinal lymph node revealed fibrosis and burnt-out granulomatous inflammation without malignancy or infection. Correlation of imaging and histology supported pulmonary sarcoidosis. Awareness of the galaxy sign may help distinguish benign granulomatous disease from malignancy in screening cohorts and guide appropriate multidisciplinary management.

Categories: Radiology, Internal Medicine, Pulmonology

Keywords: endobronchial ultrasound-guided transbronchial needle aspiration (ebus-tbna), fdg-pet/ct, granulomatous disease, incidental lung nodule, lung cancer screening, management of lung nodule, pulmonary sarcoidosis

Introduction

Low-dose CT has become increasingly established as a screening tool for the early detection of lung cancer in high-risk populations, with guideline updates and implementation efforts aimed at reducing lung cancer mortality by facilitating earlier diagnosis [1]. As screening programs expand, incidental and indeterminate pulmonary nodules are frequently encountered, often prompting further imaging and invasive investigation to exclude malignancy. While most solid or part-solid nodules in this context raise concern for primary lung cancer, certain radiologic patterns may suggest alternative benign diagnoses. The “galaxy sign” is an uncommon but characteristic CT finding, most often described in pulmonary sarcoidosis, in which a central confluent opacity is surrounded by multiple smaller satellite nodules [2]. Recognition of this pattern is clinically important, particularly in screening populations, where distinguishing granulomatous inflammation from malignancy may have significant implications for patient management.

Case Presentation

A 69-year-old man was referred to the respiratory multidisciplinary team following identification of a branching pulmonary nodule on a low-dose CT scan undertaken as part of a lung cancer screening program. He was an ex-smoker with a history of exertional breathlessness and an occasional productive cough, without hemoptysis, fever, or weight loss. He was a taxi driver with no known occupational exposures or recent travel abroad.

The screening CT scan demonstrated a 60 mm cluster of prominent, dense nodules with a central, more confluent solid focus measuring up to 20 mm in the left upper lobe (LUL; Figure 1). The patient went on to have fluorodeoxyglucose (FDG) PET imaging that demonstrated heterogeneous uptake with a relatively low SUVmax of 3.1 (Figure 2). There were also multiple prominent, slightly enlarged bilateral hilar and mediastinal lymph nodes, which demonstrated symmetrical increased uptake (SUVmax 12.5) (Figure 3, Figure 4), notably higher than the pulmonary lesion. No destructive or FDG-avid osseous lesions were identified.

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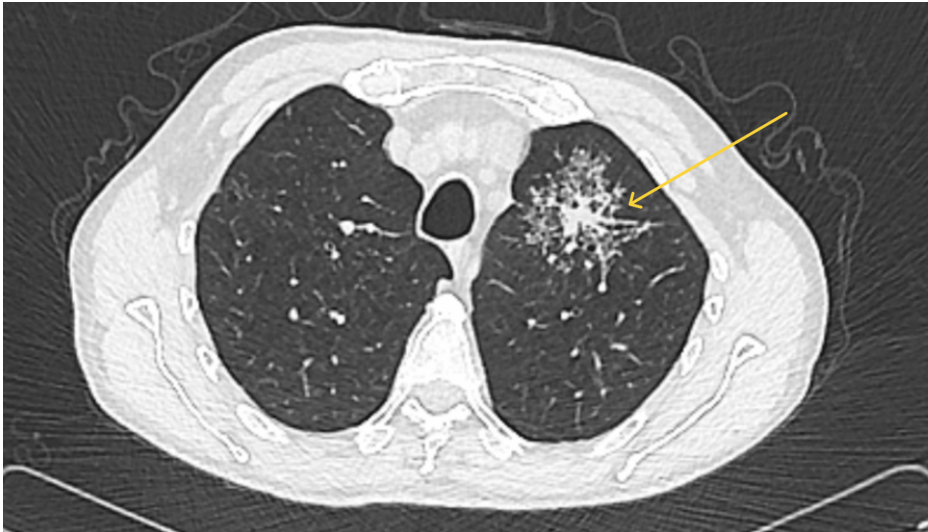


FIGURE 1: Low-dose CT scan showing a LUL dense central nodule surrounded by satellite lesions in the characteristic “galaxy sign”

LUL, left upper lobe

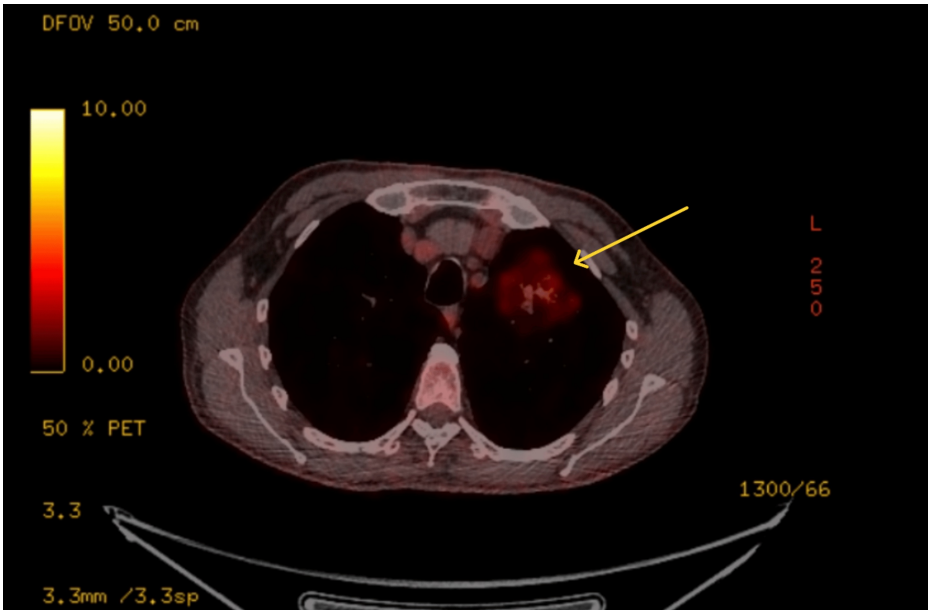


FIGURE 2: FDG PET/CT scan showing mild heterogeneous uptake within the LUL lesion

FDG, fluorodeoxyglucose; LUL, left upper lobe

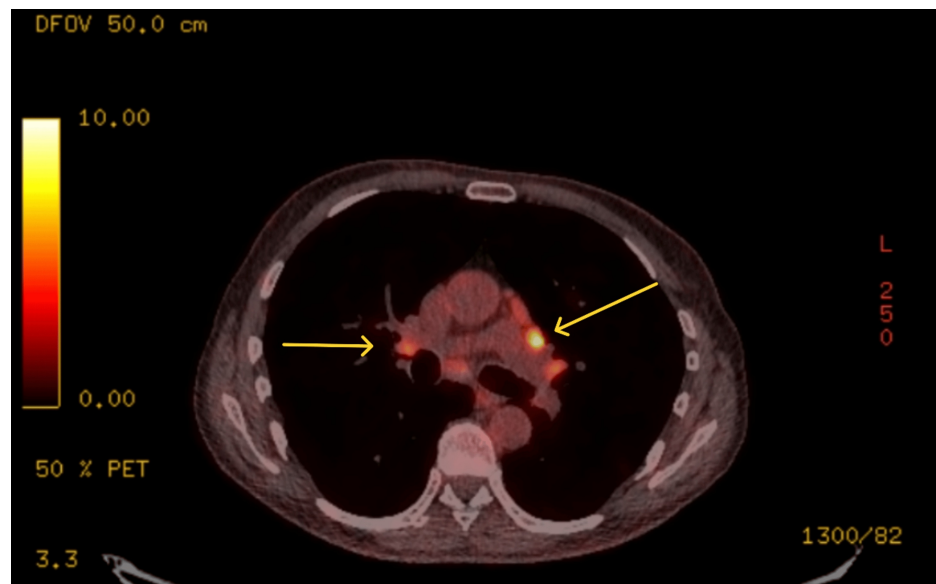


FIGURE 3: FDG PET/CT scan showing enlarged bilateral hilar lymphadenopathy with increased uptake

FDG, fluorodeoxyglucose

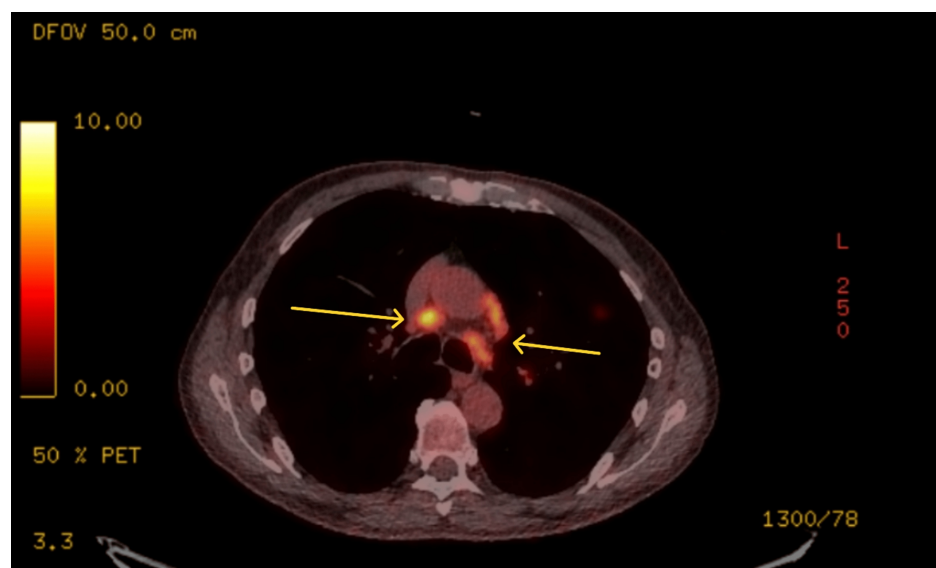


FIGURE 4: FDG PET/CT scan showing enlarged mediastinal lymphadenopathy with increased uptake

FDG, fluorodeoxyglucose

Endobronchial ultrasound-guided transbronchial needle aspiration of a mediastinal lymph node demonstrated reactive sinus histiocytosis (not Rosai-Dorfman disease) and anthracosis with prominent fibrosis (Figure 5). Scattered epithelioid histiocytes were also apparent at the periphery of fibrotic-appearing areas. No acid-fast bacilli, fungal organisms, or amyloid were identified on special stains. Bronchoalveolar lavage stains and cultures were also negative for bacterial, fungal, and acid-fast bacilli. Overall, histological findings were reported as possibly representing burnt-out granulomatous inflammation without evidence of malignancy.

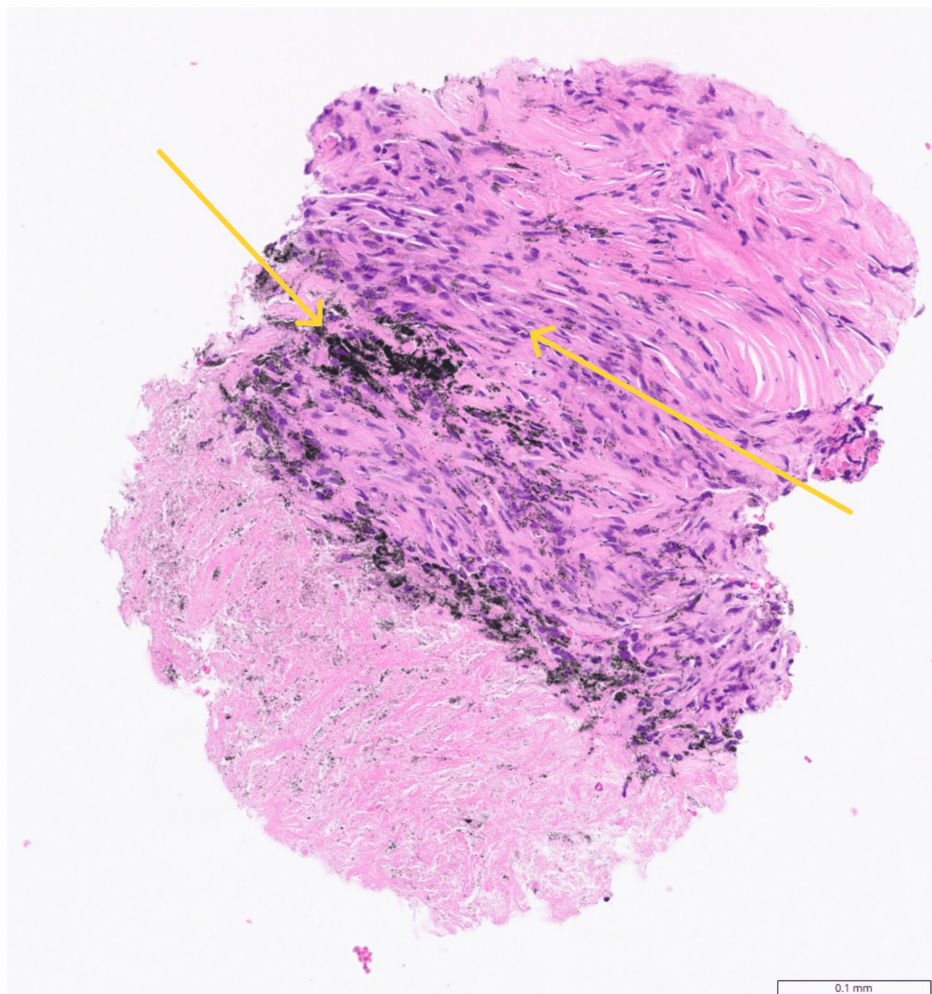


FIGURE 5: Photomicrograph of a lymph node showing fibrosis and anthracosis

Drawing together the imaging studies and histology, the respiratory multidisciplinary team determined that the appearance of the LUL dense nodule cluster was in keeping with the characteristic “galaxy sign” of pulmonary sarcoidosis rather than malignancy. A repeat low-dose CT scan was planned, and the patient was reenrolled into the screening program.

Discussion

This case illustrates the diagnostic challenge of indeterminate pulmonary nodules detected through lung cancer screening. Lesion size and the presence of a solid component initially raised concern for a spiculated lung nodule; however, several features favored a benign granulomatous process. The clustered morphology of the nodule on the CT scan was characteristic of the “galaxy sign,” first described by Nakatsu et al. in 2002 in patients with pulmonary sarcoidosis [2]. The radiological description is one of an irregular solid opacity at a confluence of smaller nodules whose density decreases towards the edge, resembling a galaxy of stars, the cause of which has been attributed to a coalescence of interstitial granulomas [3]. Distinguishing satellite nodules from spiculated nodules represents a radiological pitfall, particularly when peripheral nodules appear fused, leading to false suspicion of malignancy. Although uncommon and not pathognomonic, the “galaxy” pattern can be recognized in sarcoidosis and less commonly in other granulomatous or inflammatory lung diseases, including tuberculosis, fungal infection, pneumoconiosis, and organizing pneumonia [4]. The importance of caution when relying on imaging patterns is reinforced by cases where even classic radiologic features proved insufficient for diagnosis; for instance, cerebellar hemangioblastoma with characteristic MRI findings failed to yield histopathologic confirmation despite multiple examinations [5]. Thus, while pattern recognition aids differential diagnosis, tissue sampling remains essential when malignancy cannot be confidently excluded.

FDG PET findings also supported a nonmalignant etiology. The pulmonary lesion demonstrated only mild uptake (SUVmax 3.1), whereas there was symmetrical, highly FDG-avid bilateral hilar and mediastinal lymphadenopathy. Symmetrical nodal uptake is a recognized pattern in sarcoidosis and contrasts with the

typically asymmetric nodal involvement seen in metastatic lung cancer [6]. Endobronchial ultrasound-guided biopsy demonstrated fibrosis representing a previous inflammatory process without evidence of malignancy or infection. Correlation of the clinical presentation, imaging, and tissue sampling allowed confident exclusion of malignancy and supported a diagnosis of pulmonary sarcoidosis, resulting in surveillance rather than oncologic intervention.

Conclusions

The “galaxy sign” is a radiological phenomenon seen on chest CT (and occasionally on chest radiographs) due to the appearance of a central dense nodule surrounded by smaller satellite lesions. It is most associated with benign inflammatory or granulomatous conditions such as pulmonary sarcoidosis, but recognition of this pattern is particularly relevant in lung cancer screening populations, where indeterminate nodules containing solid components are commonly detected. Although we do not recommend diagnosing pulmonary sarcoidosis based on this finding in isolation, tissue sampling remains the gold standard for excluding malignancy; in this case, recognition of the characteristic appearance alongside further imaging and histology was supportive of the diagnosis. As lung cancer screening programs expand, awareness of characteristic but relatively uncommon imaging patterns such as the “galaxy sign” will become increasingly important in aiding clinicians to distinguish malignant from nonmalignant pulmonary nodules.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Rohan Aggarwal, Asif Azam

Acquisition, analysis, or interpretation of data: Rohan Aggarwal, Gagandeep Aulakh, Asif Azam, Mazhar Chaudri, Mir Rahman

Drafting of the manuscript: Rohan Aggarwal

Critical review of the manuscript for important intellectual content: Gagandeep Aulakh, Asif Azam, Mazhar Chaudri, Mir Rahman

Supervision: Asif Azam

Disclosures

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References

1. Lee RW, Nair A, Balata H, et al.: Implementation of the NHS England Lung Cancer Screening Programme over 5 years. *Nat Med.* 2026, [10.1038/s41591-026-04292-y](#)
2. Nakatsu M, Hatabu H, Morikawa K, et al.: Large coalescent parenchymal nodules in pulmonary sarcoidosis: “sarcoid galaxy” sign. *AJR Am J Roentgenol.* 2002, 178:1389-93. [10.2214/ajr.178.6.1781389](#)
3. Aikins A, Kanne JP, Chung JH: Galaxy sign. *J Thorac Imaging.* 2012, 27:W164. [10.1097/RTI.0b013e31826b7e6f](#)
4. Oda M, Saraya T, Shirai T, Ishikawa N, Fujiwara M, Takizawa H: Multiple huge “cluster” and “galaxy” signs on chest radiography in a patient with pulmonary tuberculosis. *Respirol Case Rep.* 2019, 7:e00398. [10.1002/rcr2.398](#)
5. Kanani J: Diagnostic challenges in hemangioblastoma: lessons from a rare case presentation . *Egypt J Neurosurg.* 2025, 40:115. [10.1186/s41984-025-00461-2](#)
6. Criado E, Sánchez M, Ramírez J, Arguis P, de Caralt TM, Perea RJ, Xaubet A: Pulmonary sarcoidosis: typical and atypical manifestations at high-resolution CT with pathologic correlation. *Radiographics.* 2010, 30:1567-86. [10.1148/rg.306105512](#)