

Monod Sign

Ashley Nitschke, MD, Peter Sachs, MD, Thomas Suby-Long, MD, and Nicole Restauri, MD

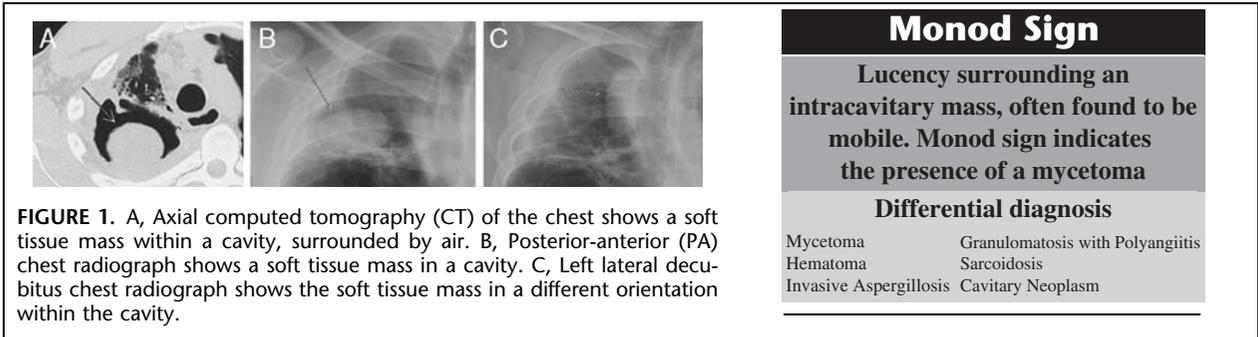


FIGURE 1. A, Axial computed tomography (CT) of the chest shows a soft tissue mass within a cavity, surrounded by air. B, Posterior-anterior (PA) chest radiograph shows a soft tissue mass in a cavity. C, Left lateral decubitus chest radiograph shows the soft tissue mass in a different orientation within the cavity.

Appearance: Monod sign refers to the presence of gas surrounding a mass within a pulmonary cavity (Fig. 1A).^{1,2} When distinguishing a “mass within a cavity” from a “cavitary mass,” evaluation of mobility is helpful (Fig. 1B, C). A freely mobile mass falls to a gravity-dependent location, highly suggestive of a mycetoma and the Monod sign.

Explanation: Monod sign indicates the presence of a mycetoma within a lung cavity. This radiographic appearance of a “uniform, rounded opacity which is...topped by a clear crescent” was described in 1954 by Pesle and Monod.¹ Free movement of the mass helps distinguish Monod sign from similar-appearing radiographic signs in which the lesion is fixed, and supports the presence of a mycetoma. However, immobility does not exclude a mycetoma that may adhere to the cavity wall or become semi-invasive. In these instances, the clinical setting is paramount to diagnosis.

Discussion: A mycetoma forms from a conglomeration of hyphae, debris, mucous or fibrin within a cavity.² Entities giving rise to parenchymal cavities include infection, granulomatous disease, and pneumoconiosis. However, mycetomas can form within cystic or cavitary lesions of any etiology. One case report describes a mycetoma, identified by Monod sign, in a cavity that developed within a pneumatocele related to a remote gunshot wound.³ While mycetomas can be asymptomatic, they may present with hemoptysis due to mechanical damage of capillaries within the cavitary wall.

Monod sign is occasionally used interchangeably with the term “air crescent sign.” The “air crescent sign,” however, classically indicates immune response recovery from invasive aspergillosis in immunocompromised patients.² Monod sign, on the other hand, indicates the presence of a mycetoma and is usually seen in immune competent patients.

Several ancillary imaging findings support the diagnosis of a mycetoma. One study found that increasing lateral wall thickness of a cavitary lesion on chest radiograph was predictive of a mycetoma on CT.⁴ However, the maximum wall thickness is usually 4mm or less in benign cavities, compared to at least 15mm in malignant cavities.⁵ In addition to cavitary wall thickness exceeding 15 mm, lower lobe or multifocal distribution should increase the suspicion for an alternative diagnosis.

Several diagnostic pitfalls exist in identifying mycetomas. For example, an intracavitary hematoma may appear as a mobile intracavitary lesion.⁶ Additionally, a mycetoma may occur concomitantly in a patient with cavitary active sarcoidosis or granulomatosis with polyangiitis. Such coexisting conditions are important to recognize, particularly if the patient is treated with immunosuppressive therapy, which may lead to the development of invasive pulmonary aspergillosis.⁷ Finally, an important consideration is the alternative or concomitant diagnosis of cavitary neoplasm. One case report describes incidentally finding cavitary adenocarcinoma upon resection of a mycetoma.⁸

In conclusion, Monod sign differentiates a mycetoma within a pre-existing cavity from similar appearing cavitary lesions. Mass mobility, hemoptysis, a pre-existing lung cavity and additional radiographic findings help support the diagnosis.

REFERENCES

1. Pesle GD, Monod O. Bronchiectasis due to aspergilloma. *Dis Chest.* 1954;25:172–183.
2. Hansell DM, Bankier AA, MacMahon H, et al. Fleischner Society: glossary of terms for thoracic imaging. *Radiology.* 2008;246:697–722.
3. Takahashi N, Kawashima A, Stroehlein KB, et al. Mycetoma of the lung in a cavity that developed from a gunshot wound. *AJR.* 1999;172:369–371.
4. Sansom HE, Baque-Juston M, Wells AU, et al. Lateral cavity wall thickening as an early radiographic sign of mycetoma formation. *Eur Radiol.* 2000;10:387–390.
5. Gadkowski LB, Stout JE. Cavitary pulmonary disease. *Clin Microbiol Rev.* 2008;21:305–333.
6. Knower MT, Kavanagh P, Chin R. Intracavitary hematoma simulating mycetoma formation. *J Thorac Imaging.* 2002;17:84–88.
7. Kantartzis SN, Dacic S, Strollo DC. Pulmonary sarcoidosis complicated by aspergilloma formation. *Radiographics.* 2012;32:469–473.
8. Smahi M, Serraj M, Ouadnouni Y, et al. Aspergilloma in combination with adenocarcinoma of the lung. *World J Surg Oncol.* 2011;9:27.

The authors declare no conflicts of interest.
Copyright © 2013 by Lippincott Williams & Wilkins