

Case Report: Thoracolith Mimicking Pulmonary Osteosarcoma Metastasis

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No human or animal experimentation was performed.

Conflict of Interest

None

ABSTRACT

A thoracolith is a small (~5 to 15 mm) smooth calcified nodule typically found incidentally in the pleural space on chest radiographs or CT scans. Its key characteristic is mobility between imaging studies. While it is a benign entity, it can rarely cause a diagnostic dilemma. In this context, we present a patient with high-grade extraosseous osteosarcoma with a thoracolith mimicking pulmonary osteosarcoma metastasis. Herein, we highlight the importance of comparing prior imaging studies to determine if there has been any positional change—indicating mobility—and diagnostic of a thoracolith, thereby obviating unnecessary workup or intervention.

CASE REPORT

BACKGROUND

We present a case of a patient with high-grade extraosseous osteosarcoma of the left thigh with a new calcified pleuropulmonary nodule during follow-up chest CT imaging. It was initially suspected to be metastatic osteosarcoma. However, simply comparing previous and subsequent follow-up chest CT studies, it was determined to be a thoracolith demonstrating mobility—the crucial diagnostic feature—throughout multiple follow-up chest CT studies.

INTRODUCTION

First reported by Dias et al. in 1968, thoracolithiasis is a condition where one or more smooth-margined nodules (~5 to 15 mm) are found within the pleural space and may contain

calcification(s) [1]. The incidence of thoracolithiasis is 0.086%, with a slight female predominance [2]. Thoracoliths are most commonly detected incidentally on imaging and rarely can be a diagnostic challenge mimicking intrapulmonary nodules or malignant lesions on chest CTs.

Herein, we present a case of a patient with high-grade extraosseous osteosarcoma of the left thigh with a new calcified pleuropulmonary nodule during follow-up chest CT imaging. It was initially suspected to be metastatic osteosarcoma. However, simply comparing previous and subsequent follow-up chest CT studies, it was determined to be a thoracolith demonstrating mobility—the crucial diagnostic feature—throughout multiple follow-up chest CT studies.

CASE PRESENTATION

A 54-year-old man complained of a “knot” in his left thigh. An MRI (Figure 1) revealed an enhancing mass in the anteromedial left thigh, later confirmed as an extraosseous osteosarcoma. Perioperative chest staging CT scan showed a calcified approximately 8 mm nodule in the left lower lobe. The nodule was suspected to be either a calcified granuloma or, in the worst case, an ossified pulmonary osteosarcoma metastasis.

Multiple subsequent chest CT studies (Figure 2) over 18 years, as part of oncologic follow-up at our institution and occasionally when the patient presented to the emergency room for other acute issues, demonstrate mobility and migration—the sine qua non and key diagnostic characteristic of a thoracololith, thus averting further workup, intervention, and, most importantly, clinician and patient angst. Therefore, the patient and oncology team opted not to confirm the diagnosis through thoroscopic intervention so as to avoid any unnecessary risks.

DISCUSSION

Thoracololiths (thoracolithiasis when multiple) are rare and benign intrapleural bodies that are often asymptomatic. They can be calcified or non-calcified, have a smooth margin, and are—most importantly—migratory. They are frequently located in the dependent part of the thoracic cavity—this includes the diaphragmatic surface, left heart border, or paravertebral space—most likely due to gravity [3].

In most cases, thoracololiths are discovered incidentally during chest CT scans for other reasons. Although benign, thoracololiths can enlarge over time and may be difficult to distinguish from malignant lesions [1,4].

The exact cause of thoracolithiasis is not yet fully understood, but there are a few possible explanations:

1. Necrosis of pleural or epipericardial fat, supported by the presence of higher amounts of pericardial fat in the left hemithorax [5].
2. Accumulation of dust particles phagocytosed by macrophages [5].
3. Previous pulmonary tuberculosis [6].
4. Spillage of gallstone(s) into the pleural space during a cholecystectomy [7].
5. Transdiaphragmatic migration of prior epiploic appendicitis or gallstone from the abdomen [7].

When a pleuroparenchymal nodule is diffusely calcified, as in our case, the differential diagnosis includes post-infectious granuloma, cement embolism, pneumoconiosis, hamartoma, and calcified metastasis [6]. Calcified mediastinal and hilar nodes, as well as splenic granulomas, are indicative of post-infectious granuloma. If branching or globular hyperdensities are found in pulmonary arteries, this suggests pulmonary cement embolism. Pneumoconiosis is characterized by the presence of perilymphatic nodules, calcified mediastinal lymphadenopathy, and pulmonary fibrosis. Benign hamartoma is favored if there are fat and popcorn-like calcifications

present, as well as singularity. Calcified pulmonary metastasis may arise from non-bone forming tumors like germ cell tumor, synovial sarcoma, mucin-producing tumors, and papillary thyroid carcinoma, and bone-forming tumors like osteosarcoma and chondrosarcoma; a known history of such tumors would support this diagnosis. Although primary lung cancers can also present with calcifications, CT scans suggest that this occurs in up to 10% of cases [8].

Comparative CT studies demonstrating mobility are crucial to confirm a thoracololith and avoid unnecessary further workup or intervention (i.e., pulmonary metastasectomy), as in our case. Suppose prior imaging studies are unavailable, and a prompt diagnosis of a thoracololith is required; in that case, repositioning the patient in the decubitus or prone position and getting a thoracololith to move and declare itself on the immediate rescan may also be helpful.

TEACHING POINT

Comparative CT studies demonstrating mobility are crucial to confirm a thoracololith and avoid unnecessary further workup or intervention (i.e., pulmonary metastasectomy), as in our case. Suppose prior imaging studies are unavailable, and a prompt diagnosis of a thoracololith is required; in that case, repositioning the patient in the decubitus or prone position and getting a thoracololith to move and declare itself on the immediate rescan may also be helpful.

QUESTIONS

Question 1: Thoracololiths occur in the:

- A. Chest wall
- B. Pleural space
- C. Lung parenchyma
- D. Airways
- E. Pulmonary vessels
- Answer: Pleural space

Question 2: The key diagnostic feature of a thoracololith is:

- A. Calcified
- B. Noncalcified
- C. Smooth margin
- D. Solitary
- E. Migration
- Answer: Migration

Question 3: Thoracololiths are LEAST likely to be found at the:

- A. Diaphragmatic surface
- B. Left heart border
- C. Paravertebral space
- D. Pleural space
- E. Lung apex
- Answer: Lung apex, most likely due to gravity.

Question 4: Potential explanations of thoracololiths include all of the following, EXCEPT:

- A. Necrosis of pleural or epipericardial fat
- B. Accumulation of dust particles phagocytosed by macrophages

- C. Previous pulmonary tuberculosis
- D. Spillage of gallstone into the pleural space
- E. Perforated appendix
- Answer: Perforated appendix

Question 5: The most important differential diagnosis of a thoracolith is:

- A. Post-infectious granuloma
- B. Cement embolism
- C. Pneumoconiosis
- D. Hamartoma
- E. Calcified metastasis
- Answer: Calcified metastasis; the remaining diagnoses are benign.

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FIGURES

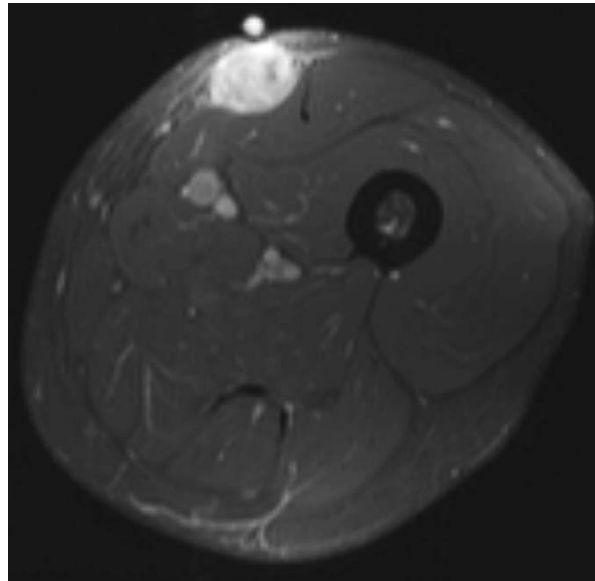


Figure 1: Axial T1-weighted fat-suppressed post-contrast image shows an enhancing mass in the anteromedial left thigh centered in the subcutaneous fat overlying the rectus femoris and sartorius muscles. Note the fiducial marker overlying the mass.

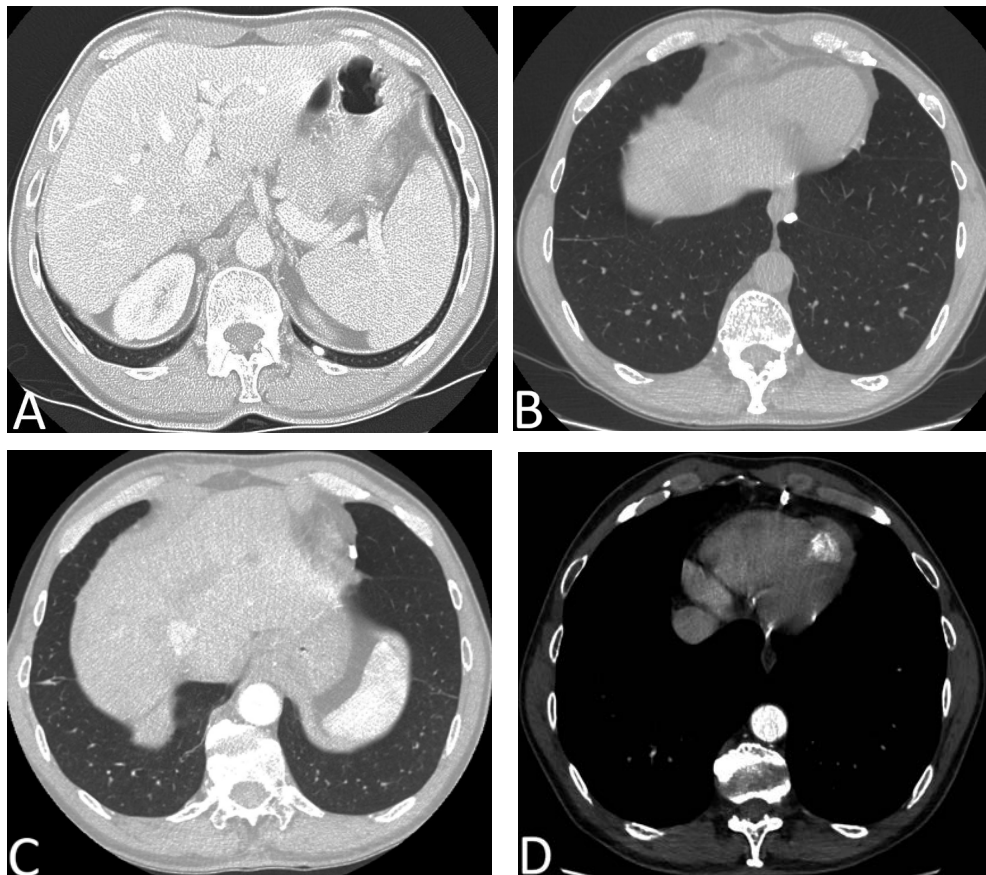


Figure 2: Axial chest CT images (A through C – lung windows and D – mediastinal window) over 18 years of follow-up show an approximately 8 mm thoracolith initially located at the posterior aspect of the left lower lobe/costophrenic sulcus (A) and subsequently migrating to the left posterior aspect of the distal esophagus (B), along the left heart (C), and along the anterior aspect of the heart (D) indicating mobility and diagnostic of a thoracolith, rather than osteosarcoma metastasis.

KEYWORDS

Thoracolith; Pulmonary; Metastasis; Osteosarcoma; Granuloma

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