

## Lung: Case Report

# Atypical Vertebral Hemangioma in a Patient With Newly Diagnosed Pulmonary Nodule



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Vertebral hemangiomas (VHs) are common, benign angiomatous lesions of the spine with an incidence rate of 10% to 12% in the population. VHs have a characteristic appearance on imaging; however, a subset demonstrate atypical features that resemble more sinister pathologic processes, such as malignant neoplasms or metastatic disease. We report a case of an atypical VH that was initially thought to be a metastasis in a 75-year-old patient with a newly diagnosed pulmonary nodule. Our goal is to highlight the key findings of VHs on various imaging modalities that can potentially help minimize unnecessary investigations or interventions.

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Vertebral hemangiomas (VHs) are common, benign angiomatous lesions of the spine with an incidence rate of 10% to 12% in the population.<sup>1</sup> Most VHs are asymptomatic and are discovered incidentally on imaging. On histologic evaluation, VHs are composed of thin-walled and blood-filled vessels surrounded by a fatty and edematous stroma.<sup>2</sup> VHs can be classified into typical and atypical variants, determined by the histologic composition of adipocytes, blood, and edema within the lesion.<sup>2</sup> Atypical VHs can mimic more sinister pathologic processes, such as malignant neoplasms or metastases, and may therefore present a challenge in diagnostic workup. This

resemblance can result in invasive diagnostic investigations, often leading to delays in diagnosis and treatment. Recognizing the radiologic findings of typical and atypical hemangiomas can potentially prevent invasive investigations and subsequent treatment delays.

We present the case of a 75-year-old woman with a newly diagnosed pulmonary nodule on computed tomography (CT) imaging who was found to have a spinal lesion associated with a pathologic fracture. This lesion was initially presumed to be metastatic, prompting multiple investigations, including spine magnetic resonance imaging (MRI), bone scintigraphy with single-photon emission CT, and spine biopsy, which did not identify evidence for malignant transformation. Whereas biopsy and resultant treatment delays could be avoided for spinal hemangiomas with a classic appearance, the MRI signal characteristics in this case were atypical, and biopsy was considered appropriate.

This 75-year-old lifelong nonsmoker presented to the emergency department with a 1-week history of pleuritic chest pain. CT pulmonary angiography was performed; it did not show evidence for pulmonary emboli. However, a 1.5-cm spiculated nodule, which was suggestive of a primary pulmonary carcinoma, was identified in the left lung apex. In addition, a pathologic fracture of a lytic T4 vertebral body was identified (Figure 1).

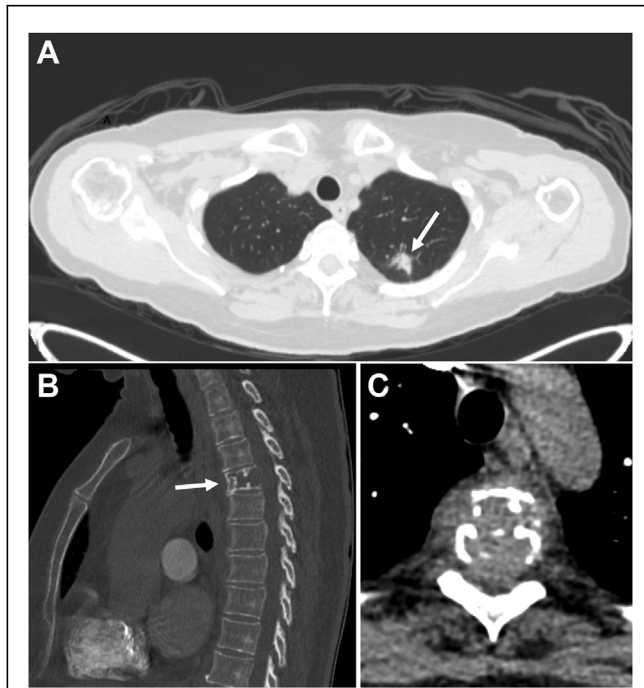
The presence of the lytic T4 vertebral lesion with pathologic fracture prompted multiple additional investigations for characterization. An MRI study was obtained; it showed the lesion to be of intermediate signal intensity on both T1- and T2-weighted images, potentially due to a metastasis and not classic for a hemangioma (Figure 2). The pathologic compression fracture was suspected to be secondary to osseous malignant disease. The positron emission tomography (PET)/CT scan demonstrated significant uptake at T4 but no other suspicious osseous lesions (Figure 3).

After consultation with the neurosurgery service, it was determined that a core biopsy specimen obtained under fluoroscopy guidance was required for definitive diagnosis. However, the biopsy specimen revealed blood only and no evidence for malignant transformation.

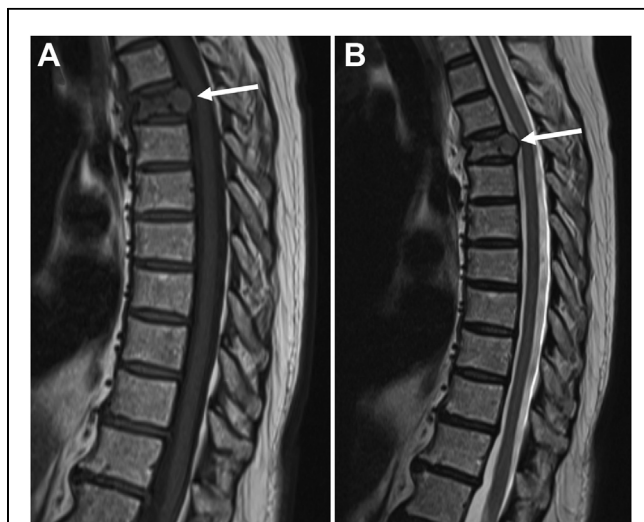
Once metastatic disease was ruled out, the patient underwent video-assisted thoracoscopic left upper

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**FIGURE 1** (A) Computed tomography axial lung window demonstrates a 1.5-cm spiculated nodule in the left upper lobe (arrow), suggestive of a primary pulmonary carcinoma. Computed tomography of the spine (B) bone view in sagittal plane and (C) soft tissue view demonstrate a pathologic fracture of a lytic T4 vertebral body (arrow). The bone has a sclerotic appearance with thickened trabeculae (C), more consistent with a vertebral hemangioma.



**FIGURE 2** Sagittal (A) T1-weighted and (B) T2-weighted magnetic resonance images demonstrate the T4 vertebral lesion (arrows). This vertebral lesion is of intermediate signal intensity on both T1- and T2-weighted images, increasing the suspicion for metastasis. This finding can occur in approximately 8.5% of atypical hemangiomas.

lobectomy with curative intent. The pathologic examination confirmed a well-differentiated, acinar-predominant invasive adenocarcinoma. The tumor was 1.5 cm in greatest dimension, and all regional lymph nodes examined were negative. This pathologic appearance corresponds to a TNM classification of pT1b N0 M0 and prognostic stage grouping of IA2.<sup>3</sup> The 5-year overall survival for a stage IA2 non-small cell lung cancer is 83% compared with the 10% 5-year survival of the initially presumed stage IVA cancer.<sup>3</sup> A surveillance CT scan of the chest performed postoperatively at 6 months did not detect recurrence of the cancer. The T4 vertebral body fracture was managed nonoperatively.

#### COMMENT

This case highlights the importance of identifying key radiographic features of atypical VHs.

**FEATURES ON CT.** One finding of VHs on CT scans is the polka-dot sign. Seen as high-attenuation dots on the axial plane, the sign represents the thickened trabeculae adjacent to the vascular channels of the lesion.<sup>2</sup> On sagittal planes, this finding is called the corduroy sign. This finding is pathognomonic for VHs.<sup>2</sup> Whereas the CT scan from this case did not reveal the classic polka-dot appearance, thickened, sclerotic trabeculae were observed (Figure 2), which would favor a benign hemangioma over a metastasis.

**FEATURES ON MRI.** Typical VHs demonstrate hyperintense signal on both T1- and T2-weighted images due to intralésional fat on T1 imaging and high water content on T2 imaging.<sup>4</sup> The proportion of the lesion composed of blood vessels, edema, and adipocytes will ultimately determine the MRI appearances. Aggressive hemangiomas, which often arise from atypical hemangiomas, tend to have high vascularity and low fat content compared with typical hemangiomas and as a result often demonstrate hypointense or isointense signal on T1-weighted images and hyperintense signal on T2-weighted images.<sup>5</sup>

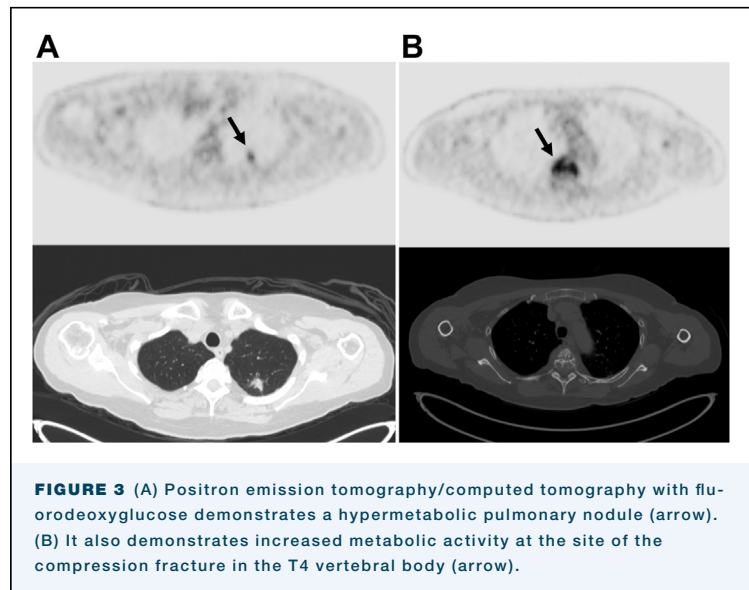
On T1-weighted sequences, atypical VHs and metastases both have a similar intermediate signal appearance.<sup>5</sup> Therefore, the differentiation between the 2 entities is better appreciated on T2-weighted images. Most hemangiomas, both typical and atypical, are hyperintense on T2-weighted images. This is in contrast to metastases, which typically demonstrate low to intermediate T2 signal, with a surrounding hyperintense rim.<sup>6</sup> If the lesion demonstrates the characteristic hyperintense signal on a T2-weighted image along with findings of thickened trabeculae on

CT imaging, a percutaneous biopsy may be safely omitted.

Exceptions to this do exist, however. In a study of 95 patients, 8.5% of patients had VHs that demonstrated intermediate T2 signal.<sup>7</sup> This variation in appearance makes differentiation from a metastasis challenging, often requiring additional investigation. In this reported case, the lesion demonstrated intermediate signal intensity on both T1- and T2-weighted images, which increased the suspicion for a metastasis and led to percutaneous biopsy.

**FEATURES ON SCINTIGRAPHY.** Fluorodeoxyglucose (FDG) PET/CT imaging has long been considered standard of care to characterize pulmonary masses and to stage pulmonary carcinomas. Metastases in the setting of lung cancer are typically FDG avid, whereas most VHs either demonstrate minimal FDG uptake or are hypometabolic. Case reports of intensely avid hemangiomas do exist, however.<sup>8</sup> It is hypothesized that the increased metabolic activity observed in a VH could be secondary to internal hemorrhage and inflammation.<sup>8</sup> In this case report, the hypermetabolism is likely to be due to hemorrhage and inflammation secondary to the compression fracture.

**CONCLUSION.** In the context of a presumed primary pulmonary carcinoma, as seen in this case report, presence of a VH with atypical radiographic features can pose a significant diagnostic challenge through its resemblance to a bone metastasis. Being aware of features of typical and atypical VHs on CT, MRI,



**FIGURE 3** (A) Positron emission tomography/computed tomography with fluorodeoxyglucose demonstrates a hypermetabolic pulmonary nodule (arrow). (B) It also demonstrates increased metabolic activity at the site of the compression fracture in the T4 vertebral body (arrow).

and FDG PET/CT can assist with management and potentially prevent unnecessary investigations and interventions.

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#### DISCLOSURES

The authors have no conflicts of interest to disclose.

#### PATIENT CONSENT

Obtained.

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