# Atypical Hemangioma Mimicking Metastasis on 18F-Sodium Fluoride Positron Emission Tomography-Computed Tomography and Magnetic Resonance Imaging: Gallium-68-Prostate-Specific Membrane Antigen Positron Emission Tomography Improves the Specificity of Bone Lesions


## Abstract

Vertebral hemangioma is a benign condition, but sometimes, it might represent as diagnostic dilemma especially in elderly patient mimicking serious pathology like metastasis. We report a case of a 66-year-old man with prostate cancer. 18F-sodium fluoride positron emission tomography-computed tomography ($^{18}$F-NaF PET-CT) demonstrates increased radiotracer uptake at body of D4 vertebra. Magnetic resonance imaging shows features of atypical hemangioma; however, metastasis cannot be ruled out. To rule out bone metastasis, gallium-68-prostate-specific membrane antigen PET-CT is performed which shows no abnormal lesion. Eight-month follow-up by $^{18}$F-NaF PET-CT showed persistent osteoblastic lesion at D4 without any significant change thus, confirming the initial diagnosis of atypical hemangioma.



**Keywords:** *18F-sodium fluoride positron emission tomography-computed tomography, atypical vertebral hemangioma, gallium-68-prostate-specific membrane antigen, prostate cancer*



**Sharjeel Usmani, Fahad Marafi, Rashid Rasheed, Fareeda Al Kandari, Najeeb Ahmed[1]**

*Department of Nuclear Medicine, Kuwait Cancer Control Center, Khaitan, Kuwait, [1]Department of Radiology, Jack Brignall PET/CT Centre, Castle Hill Hosptial, Cottingham, England*


A 66-year-old man has high-risk prostate cancer with Gleason score (4+5). 18F-sodium fluoride positron emission tomography-computed tomography ($^{18}$F-NaF PET-CT) performed after injection of 6.7 mCi of $^{18}$F-NaF for staging [Figure 1]. $^{18}$F-NaF PET-CT showed solitary osteoblastic lesion at the body of D4 vertebra. Magnetic resonance imaging showed features of atypical hemangioma; however metastasis cannot be ruled out [Figure 2]. To rule out bone metastasis, gallium-68-prostate-specific membrane antigen (Ga-68 PSMA) PET-CT is performed which shows no abnormal lesion. Eight-month follow-up by $^{18}$F-NaF PET-CT showed persistent osteoblastic lesion at D4 without any significant change thus, confirming the initial diagnosis of atypical hemangioma [Figure 3].

Hemangioma is one of the most common benign tumors of the spine, with a reported prevalence of 10%–12%.[1] Vertebral hemangiomas develop most frequently in the thoracic spine followed by the lumbar spine.[2] Hemangiomas in the vertebrae cause rarefaction with exaggerated vertical coarse striations. This appearance has been described on radiographs and CT as "polka-dot," "honeycomb," "corduroy cloth," "jail bar," and "salt and pepper," with a decrease in the overall density of the vertebral body due to the presence of fatty marrow.[3] At scintigraphy, the appearance of osseous hemangiomas ranges from photopenia to a moderate increase in radiotracer uptake.

Magnetic resonance imaging (MRI) features largely depend on the proportion of fat and vascularity of the lesions. T1-weighted MRI has areas of high-signal intensity due to high-fat content, while T2-weighted images of high-signal intensity typically correspond to the vascularity of hemangiomas.[4] Atypical hemangiomas, which may vary in appearance, include those that are hypointense on T1-weighted images but retain the typical characteristics on T2-weighted and fat-suppressed postcontrast images.[5] This appearance may resemble a metastatic lesion, which also has low signal on T1-weighted and high signal on T2-weighted images.[6] The signal intensities of atypical hemangiomas can be


**How to cite this article:** Usmani S, Marafi F, Rasheed R, Al Kandari F, Ahmed N. Atypical hemangioma mimicking metastasis on 18F-sodium fluoride positron emission tomography-computed tomography and magnetic resonance imaging: Gallium-68-prostate-specific membrane antigen improves the specificity of bone lesions. Indian J Nucl Med 2018;33:171-3.





***Address for correspondence:***
*Dr. Sharjeel Usmani, Department of Nuclear Medicine, Kuwait Cancer Control Center, PO Box: 1488, 83001 Khaitan, Kuwait. E-mail: dr_shajji@yahoo.com*



**Access this article online**

**Website:** www.ijnm.in

**DOI:** 10.4103/ijnm.IJNM_150_17

**Quick Response Code:**

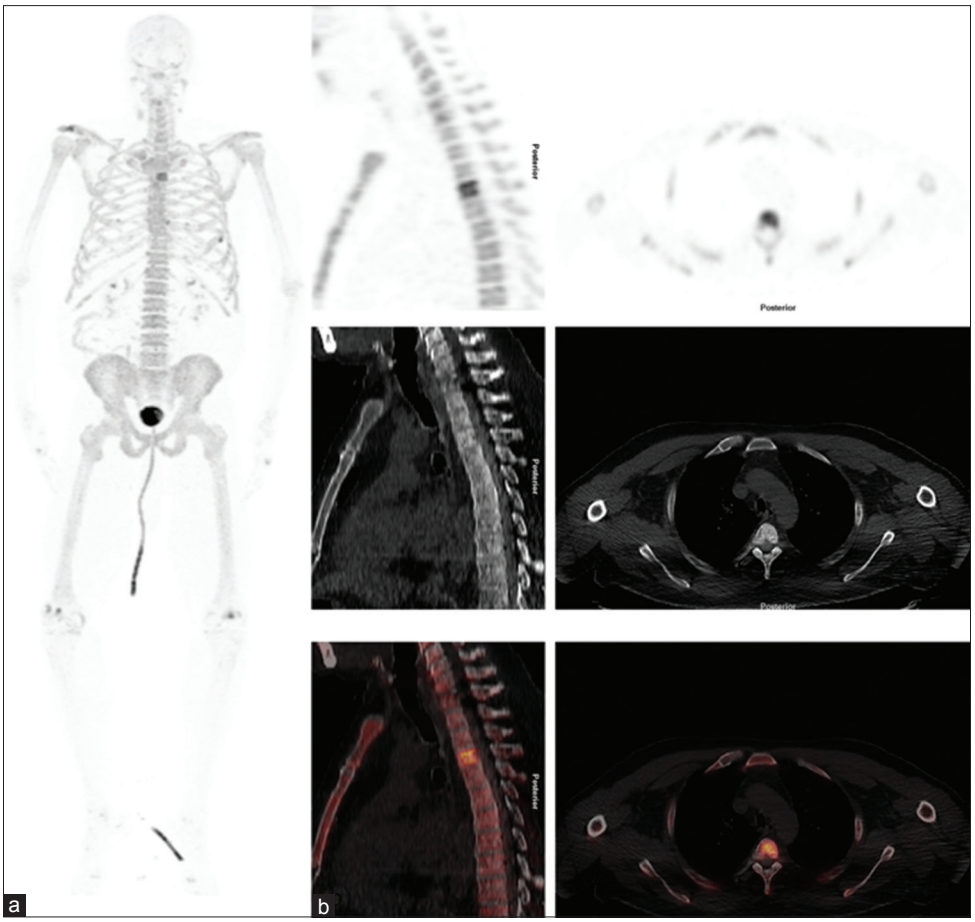


**Figure 1: (a) Positron emission tomography sodium fluoride maximum intensity projection images, (b) coronal and transaxial sodium fluoride positron emission tomography images showing focal area of increased radiotracer activity in body of D4 vertebra, noncontrast computed tomography component showing sclerotic lesion**

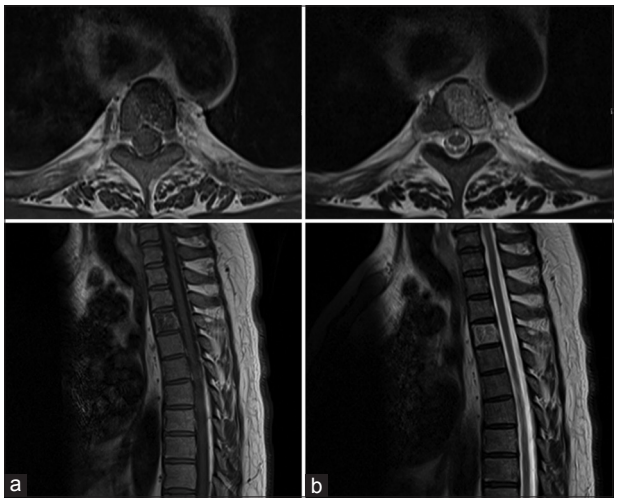


**Figure 2: (a) Magnetic resonance imaging T1-weighted transaxial, saggital images showing hypointense marrow over D4 vertebra. (b) T2-weighted transaxial, sagittal images showing hyperintense lesion, predominantly along the periphery, with marginal contrast uptake. No associated soft tissue component noted. Findings suggestive of atypical hemangioma, however, metastasis cannot be ruled out**

indeterminate, but the morphology of the lesion, including the presence of coarse trabeculae, can be used to make the diagnosis. For indeterminate cases, CT can be used as CTs are more sensitive to the characteristic osseous remodeling of hemangiomas than MRI. If necessary, follow-up examinations can be performed to ensure stability.

$^{18}$F-NaF PET-CT is a sensitive tool for detecting skeletal metastases.[7,8] Ga-68 PSMA is a promising tracer for both staging and detection of biochemical recurrence in prostate cancer.[9] Preliminary data indicate that the detection rate of Ga-68 PSMA PET-CT is clearly superior to the planar bone scan in the detection of osseous metastasis;[10] however, a direct comparison with $^{99m}$Tc-SPECT/CT or $^{18}$F-NaF PET-CT may be useful to assess the superiority of Ga-68 PSMA over bone scan. We report our experience regarding the value of Ga-68 PSMA in diagnosis, characterization, and differentiation of atypical hemangioma from spinal metastasis. The atypical and typical hemangiomas may not express PSMA and do not show increased tracer uptake, while the metastases from prostate showed increased tracer uptake, suggestive of PSMA expression. Therefore, Ga-68 PSMA could be suggested as an effective complementary imaging method to MRI, particularly for enhancing diagnostic specificity.

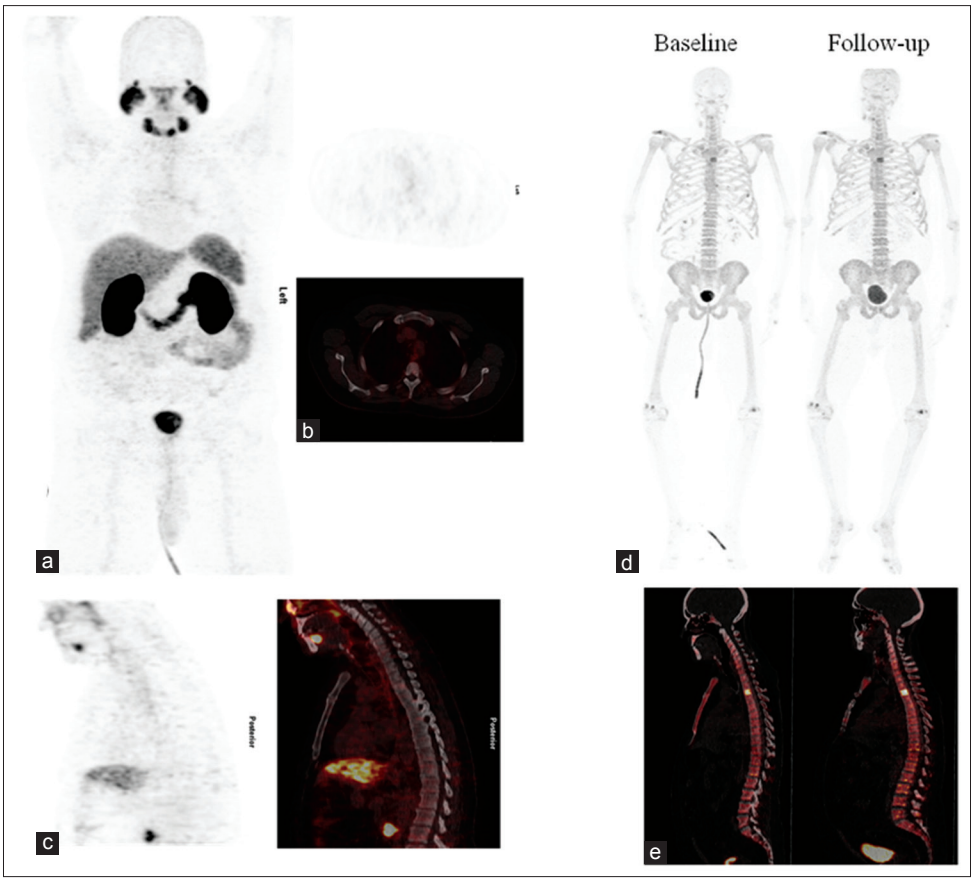


**Figure 3: (a) Maximum intensity projection images of gallium-68-prostate-specific membrane antigen. (b and c) Transaxial, sagittal gallium-68-prostate-specific membrane antigen positron emission tomography and fused positron emission tomography-computed tomography images do not show any abnormal uptake. (d and e) 8-month follow-up maximum intensity projection and fused sagittal images of 18F-sodium fluoride positron emission tomography-computed tomography showing persistent osteoblastic bone lesion at the body of D4 with no time interval change noted**

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

1. Chi JH, Manley GT, Chou D. Pregnancy-related vertebral hemangioma. Case report, review of the literature, and management algorithm. Neurosurg Focus 2005;19:E7.
2. Hemmy DC. Vertebral hemangiomas. In: Wilkins RH, Rengachary SS, editors. Neurosurgery. New York: McGraw-Hill; 1996. p. 1827-9.
3. Grossman RI, Yousem DY. Nondegenerative diseases of the spine. In: Neuroradiology. 3rd ed. Philadelphia: Mosby; 2003. p. 827-8.
4. Ross JS, Masaryk TJ, Modic MT, Carter JR, Mapstone T, Dengel FH, *et al.* Vertebral hemangiomas: MR imaging. Radiology 1987;165:165-9.
5. Leeds NE, Kumar AJ, Zhou XJ, McKinnon GC. Magnetic resonance imaging of benign spinal lesions simulating metastasis: Role of diffusion-weighted imaging. Top Magn Reson Imaging 2000;11:224-34.
6. Cross JJ, Antoun NM, Laing RJ, Xuereb J. Imaging of compressive vertebral haemangiomas. Eur Radiol 2000;10:997-1002.
7. Grant FD, Fahey FH, Packard AB, Davis RT, Alavi A, Treves ST, *et al.* Skeletal PET with 18F-fluoride: Applying new technology to an old tracer. J Nucl Med 2008;49:68-78.
8. Even-Sapir E, Metser U, Mishani E, Lievshitz G, Lerman H, Leibovitch I, *et al.* The detection of bone metastases in patients with high-risk prostate cancer: 99mTc-MDP planar bone scintigraphy, single- and multi-field-of-view SPECT, 18F-fluoride PET, and 18F-fluoride PET/CT. J Nucl Med 2006;47:287-97.
9. Perera M, Papa N, Christidis D, Wetherell D, Hofman MS, Murphy DG, *et al.* Sensitivity, specificity, and predictors of positive 68Ga-prostate-specific membrane antigen positron emission tomography in advanced prostate cancer: A Systematic review and meta-analysis. Eur Urol 2016;70:926-37.
10. Pyka T, Okamoto S, Dahlbender M, Tauber R, Retz M, Heck M, *et al.* Comparison of bone scintigraphy and 68Ga-PSMA PET for skeletal staging in prostate cancer. Eur J Nucl Med Mol Imaging 2016;43:2114-21.