

**Identification of Heterotopic Ossification Using
18
F-NaF PET/CT**

Seraj, Siavash Mehdizadeh; Al-Zaghal, Abdullah; Østergaard, Brian; Høilund-Carlsen, Poul F.; Alavi, Abass

Published in:
Clinical Nuclear Medicine

DOI:
10.1097/RLU.0000000000002448

Publication date:
2019

Document version:
Accepted manuscript

Citation for pulished version (APA):

Seraj, S. M., Al-Zaghal, A., Østergaard, B., Høilund-Carlsen, P. F., & Alavi, A. (2019). Identification of Heterotopic Ossification Using ¹⁸F-NaF PET/CT. *Clinical Nuclear Medicine*, 44(4), 319-320.
<https://doi.org/10.1097/RLU.0000000000002448>

Go to publication entry in University of Southern Denmark's Research Portal

Terms of use

This work is brought to you by the University of Southern Denmark.
Unless otherwise specified it has been shared according to the terms for self-archiving.
If no other license is stated, these terms apply:

- You may download this work for personal use only.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim.
Please direct all enquiries to puresupport@bib.sdu.dk

Identification of Heterotopic Ossification Using ^{18}F -NaF/CT

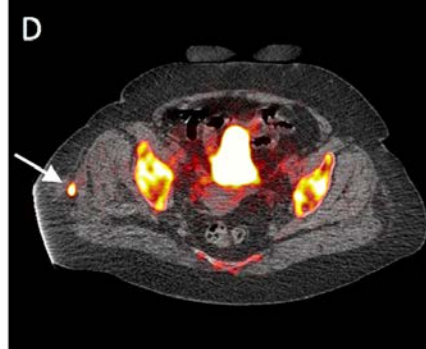
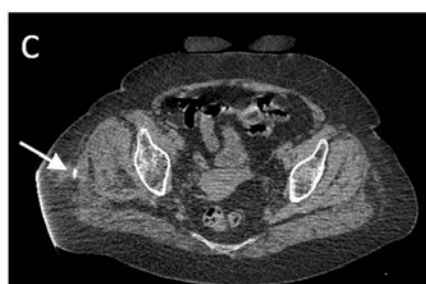
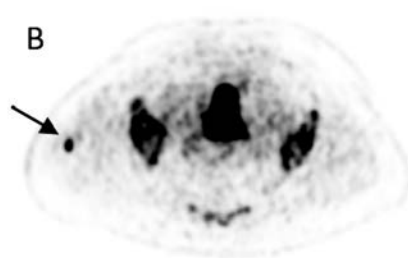
Abstract

Heterotopic ossification (HO) is a benign condition characterized by the abnormal formation of mature lamellar bone in extra-skeletal soft tissues. Most frequently, HO is observed around the hip joint after fractures or surgical procedures such as open reduction internal fixation or total hip arthroplasties. We are presenting a case of HO as detected by ^{18}F -NaF PET/CT in a 68-year-old woman with history of internal-fixation of the right hip. Many previous publications have reported ^{18}F -NaF uptake portraying calcification in soft tissue, these reports demonstrate the feasibility of ^{18}F -NaF PET/CT to assess extra-osseous calcification.

Keywords:

Heterotopic ossification, calcification, NaF, PET, multiple myeloma

Figure 1. Coronal maximum intensity projection (MIP) ^{18}F -NaF PET (A), axial ^{18}F -NaF PET (B), CT (C), and fused ^{18}F -NaF PET/CT (D) images. A 68-year-old female known to have multiple myeloma had undergone ^{18}F -NaF PET/CT imaging. No history of prior chemotherapy, known inflammatory disease, recent radiotherapy was present at the time of imaging. The patient had undergone surgical internal-fixation of the right hip joint. Unexpected ^{18}F -NaF uptake in the right gluteal region was noted on PET images (A and B, black arrows). Focal ^{18}F -NaF avidity (SUVmean of 9.7, SUVmax of 15.6) corresponded to heterotopic ossification (HO) detected by CT (C, white arrow; average Hounsfield unit of 237). The most common etiologies of HO are: neurogenic, genetic and traumatic. Severe burns, fractures, dislocations and operative procedures are typical scenarios for traumatic HO [1]. Moreover, incidence of HO is tied to hip surgical procedures [1]. Although the definitive physiologic factor triggering HO has remained uncertain, it is believed that the inappropriate differentiation of pluripotential mesenchymal cells into osteoblastic stem cells is the causal factor [2]. The degree of ^{18}F -NaF uptake in skeleton measures the amount of osteoblastic activity [3]. In soft tissue, NaF uptake depends on the rate of calcium deposition rather than the density of the calcification, therefore, the observed NaF uptake in the site of calcification indicates an active process of calcium salts deposition [3]. Our findings along with another recent study [4] provide evidence that ^{18}F -NaF PET has a potential role in assessing HO regardless of its etiology. Previous research studies have also showed ^{18}F -NaF uptake in extra-osseous tissues [5-14]. These reports have led to increased interest in the feasibility of ^{18}F -NaF PET/CT to assess extra-osseous calcification.



References

1. Balboni TA, Gobeze R, Mamon HJ. Heterotopic ossification: pathophysiology, clinical features, and the role of radiotherapy for prophylaxis. *International Journal of Radiation Oncology* Biology* Physics* 2006;65:1289-1299.
2. Naraghi FF, DeCoster TA, Moneim MS, Miller RA, Rivero D. Heterotopic ossification. *Orthopedics* 1996;19:145-152.
3. Raynor W, Houshmand S, Gholami S, Emamzadehfard S, Rajapakse CS, Blomberg BA, *et al.* Evolving role of molecular imaging with 18F-sodium fluoride PET as a biomarker for calcium metabolism. *Current osteoporosis reports* 2016;14:115-125.
4. Eekhoff EMW, Botman E, Netelenbos JC, de Graaf P, Bravenboer N, Micha D, *et al.* [18F] NaF PET/CT scan as an early marker of heterotopic ossification in fibrodysplasia ossificans progressiva. *Bone* 2018;109:143-146.
5. Al-Zaghal A, Seraj SM, Werner TJ, Gerke O, Høilund-Carlsen PF, Alavi A. Assessment of Physiological Intracranial Calcification in Healthy Adults Using 18F-NaF PET/CT. *Journal of Nuclear Medicine* 2018;jnumed. 118.213678.
6. Al-Zaghal A, Werner TJ, Høilund-Carlsen PF, Alavi A. Identification of Tracheobronchial Tree Calcifications Using Molecular Imaging Probes: 18F-NaF PET/CT. *Clinical nuclear medicine* 2018;43:e278-e279.
7. Al-Zaghal A, Werner TJ, Høilund-Carlsen PF, Alavi A. The Detection of Uterine Leiomyoma (Fibroid) Calcifications on 18F-NaF PET/CT. *Clinical nuclear medicine* 2018;43:e287-e288.
8. Asmar A, Simonsen L, Svolgaard B, Bülow J. Unexpected Diffuse 18F-NaF Uptake in the Lung Parenchyma in a Patient With Severe Hypercalcemia Due to Myelomatosis. *Clinical nuclear medicine* 2017;42:68-69.
9. Zhu Y, Chen Y, Huang Z, Liu L. Unsuspected Metastatic Ovarian Cancer Revealed by 18F-NaF PET/CT Performed to Evaluate Lower-Back Pain. *Clinical nuclear medicine* 2017;42:154-156.
10. Chou Y-H, Ko K-Y, Cheng M-F, Chen W-W, Yen R-F. 18F-NaF PET/CT Images of Cardiac Metastasis From Osteosarcoma. *Clinical nuclear medicine* 2016;41:708-709.
11. Salgarello M, Lunardi G, Inno A, Pasetto S, Severi F, Gorgoni G, *et al.* 18F-NaF PET/CT Imaging of Brain Metastases. *Clinical nuclear medicine* 2016;41:564-565.
12. Shao F, Wu J, Huang Z, Zhou F, Chen Y. Serendipitous detection of Hodgkin lymphoma by 18F-NaF PET/CT. *Clin Nucl Med* 2016;41:815-818.
13. Shao F, Zou Y, Cai L, Wang X, Chen Y. Unexpected Detection of Urinary Bladder Cancer on Dual Phase 18F-NaF PET/CT in a Patient With Back Pain. *Clinical nuclear medicine* 2016;41:902-904.
14. Raynor W, Al-Zaghal A, Werner T, Høilund-Carlsen P, Alavi A. 18F-NaF PET/CT in Prostatic Calculi. *Clinical nuclear medicine* 2018.

Formateret: Dansk