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

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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 18F-NaF PET/CT in a 68-year-old woman with history of internal-fixation of the right hip. Many previous publications have reported 18F-NaF uptake portraying calcification in soft tissue, these reports demonstrate the feasibility of 18F-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


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