

18F-FDG-PET/CT versus 18F-Fluoride-PET/CT for Detecting Bone Metastases in Patients With Breast Cancer and Equivocal Bone Scan

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Abstract

Whole-body bone scintigraphy (BS) with ^{99m}Tc-MDP has the highest cost-benefit ratio for bone metastasis (BM) diagnosis on breast cancer (BC) patients. However, BS frequently shows inconclusive findings, making necessary the use of complementary exams. This study aimed to compare ¹⁸F-Fluoride-PET/CT and ¹⁸F-FDG-PET/CT for the diagnosis of BM on BC patients with inconclusive BS for BM.

Key words:

bone metastasis, fludeoxyglucose, fluoride.

Introduction

Bone is one of the most regular site for metastasis on various carcinomas, being specially common on breast cancer (BC). The early detection of bone metastasis (BM) plays a major role on delivering the appropriate treatment for the patient.

Whole-body bone scintigraphy (BS) with ^{99m}Tc-MDP is the conventional test to find BM, due to its high cost-benefit ratio; however, BS frequently shows inconclusive findings, making necessary the use of complementary exams.

This study compared ¹⁸F-Fluoride-PET/CT and ¹⁸F-FDG-PET/CT for the diagnosis of BM on BC patients with inconclusive BS.

Results and Discussion

18 patients participated on this study. The inclusion criteria was: sign the informed consent document, show a BS with inconclusive findings for BM, been undiagnosed for BM and accept the realization of ¹⁸F-Fluoride-PET/CT and ¹⁸F-FDG-PET/CT.

The clinical and imaging follow-up identified BM on 12 of the 18 patients with inconclusive BS. The ¹⁸F-Fluoride-PET/CT detected BM on all the 12 patients, while ¹⁸F-FDG-PET/CT only found BM on 9 patients.

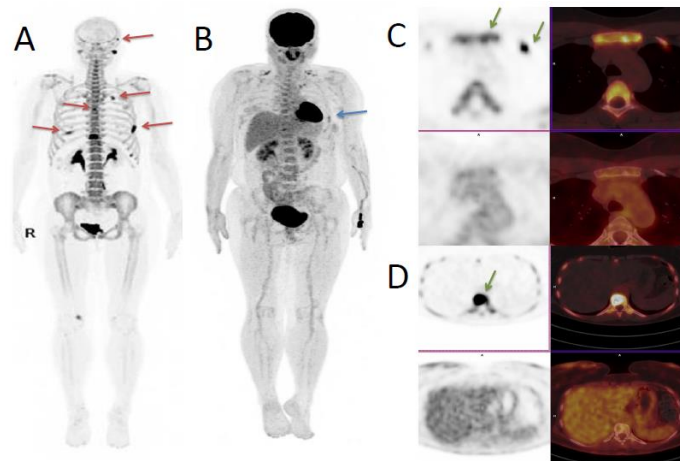
On 5 of the 12 BM patients, ¹⁸F-Fluoride-PET/CT diagnosed 26 additional BM, while ¹⁸F-FDG-PET/CT only found extra lesions on 2 of the 12 patients. However, ¹⁸F-FDG-PET/CT detected 48 additional BM, most of them in a single patient.

Together, both exams identified 68 lesions in addition to the 33 confirmed by BS, indicating a higher accuracy in relation to BS. ¹⁸F-Fluoride-PET/CT detected 67 of the 101 lesions, while ¹⁸F-FDG-PET/CT, 72 of the 101.

Chart 1. ¹⁸F-Fluoride-PET/CT and ¹⁸F-FDG-PET/CT sensitivity on detection of lytic, sclerotic, mixed and early stage lesions.

Predominant characteristic on CT	Metastatic lesions (n = 101)	Sensitivity ¹⁸ F-Fluoride-PET/CT (n = 67)	Sensitivity ¹⁸ F-FDG-PET/CT (n = 72)
Lytic	19	68%	68%
Sclerotic	26	85%	42%
Mixed	4	75%	50%
Early stage lesion	52	55%	88%

Image 1. Female patient, 48 years old. (A) ¹⁸F-Fluoride-PET/CT showed lesions on left temporal bone, 1st, 6th and 10th left ribs, 9th right rib, T10 and sternum (red arrows). (B) ¹⁸F-FDG-PET/CT only identified the lesion on 6th left rib (blue arrow). (C, D) Axial images emphasizing sternum, 1st left rib and T10 lesions (green arrows), none of them were detectable on ¹⁸F-FDG-PET/CT.



Conclusions

On the present study, ¹⁸F-Fluoride-PET/CT was considered the best complementary exam to diagnose BM on patients with inconclusive BS findings.

¹⁸F-Fluoride-PET/CT had a higher sensitivity for sclerotic and mixed lesions, an equal sensitivity for lytic lesions and inferior sensitivity for early stage lesions. Interestingly, ¹⁸F-FDG-PET/CT detected a large amount of early stage lesions in a single patient; rising significantly his sensitivity for this kind of BM.

¹ Tamawska-Pierścińska M, et al. Bone metastases diagnosis possibilities in studies with the use of ¹⁸F-NaF and ¹⁸F-FDG. *Nuclear Med Rev* 2011;14, 2: 105–108.

² Bortot DC, et al. ¹⁸F-Fluoride PET/CT is highly effective for excluding bone metastases even in patients with equivocal bone scintigraphy. *Eur J Nucl Med Mol Imaging*. 2012 Nov;39(11):1730-6.