



SODIUM FLUORIDE PET/CT SCAN IS MORE ACCURATE TO DETECT BONE METASTASIS IN ADVANCED PROSTATE CANCER

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ABSTRACT

Background: The current standard for imaging Castration Resistant Prostate Cancer (CRPC) is aimed at detecting metastatic lesions to the bones. However, discovery, validation, and implementation of new imaging modalities have fallen considerably behind that of new therapies for this population. Recent studies have shown the Na¹⁸F PET/CT Scans are significantly more sensitive and accurate in detecting bone lesions than conventionally used Bone Scintigraphy with Technetium-99 (Tc-99). This study conducted retrospective analysis to compare the competence of these two methods for identifying bone metastases.

Methods: We conducted a charts review of 613 patients being currently treated with androgen deprivation therapy (ADT) and identified 55 patients who obtained a Na¹⁸F PET/CT Scan.

Results: The median age was 75.5 years with a range of 52-89, for our cohort. Of these 55 patients, 5 (11.9%) were determined to have metastasis with Tc-99 Bone Scintigraphy alone while 27 (49.1%) were determined to have metastases with Na¹⁸F PET/CT Scan (p<0.005). 8 (19%) patients had equivocal findings on Tc-99 Bone Scintigraphy. Therefore, for all of them we performed Na¹⁸F PET/CT scan to define a bone metastatic disease that demonstrated in 5 (62.5%) cases of these as having no bone involvement and 3(37.5%) as positive for bone lesions (Table). However, data of Na¹⁸F PET/CT scan also indicated 5(9%) patients as having equivocal findings for metastatic disease.

Conclusions: According to our data, Na¹⁸F PET/CT scan is more sensitive for detecting bone lesions (49.1 vs. 11.9%). It was also possible to delineate equivocal TC-99 Bone Scintigraphy findings, where it deemed 62.5% as negative and 37.5% as positive for bone lesions. Na¹⁸F PET/CT scan is a feasible option for CRPC for detecting bone metastases, early in disease progression. With coverage of this procedure by Medicare patients have more sensitive and specific tool for early diagnosis and monitoring of treatment of CRPC.

Objective

- The purpose of the current study was to retrospectively compare the diagnostic accuracy of two imaging modalities, Tc-99 and Na¹⁸F PET/CT scans, in detection of bone metastases. The other aim was to evaluate a specific subgroup of patients with inconclusive finding on Tc-99 bone scan, and to study the ability of Na¹⁸F PET/CT scan to confirm or exclude bone metastases in these patients. Thus, we were able to evaluate the specificity of Na¹⁸F PET/CT scan in patients with non-specific findings on Tc-99 bone scan.

Methods and Materials

- We conducted a chart review of 613 patients at our bone clinic treated currently with androgen deprivation therapy (ADT) for local-advanced or advanced prostate cancer and identified 55 patients who obtained a Na¹⁸F PET/CT Scan. 42 patients from them underwent diagnostic Tc-99 bone scan early and then have been switched to Na¹⁸F PET/CT Scan procedure to validate initial data.

RESULTS

- The median age was 75.5 years with a range of 52-89, for our cohort. Of these 55 patients, 5 (11.9%) were determined to have metastasis with Tc-99 Bone Scintigraphy alone while 27 (49.1%) were determined to have metastases with Na¹⁸F Scan (p<0.005). 8 (19%) patients had equivocal findings on Tc-99 Bone Scintigraphy. Therefore, for all of them we performed Na¹⁸F scan to define a bone metastatic disease that demonstrated in 5 (62.5%) cases of these as having no bone involvement and 3(37.5%) as positive for bone lesions (Table 1). However, data of Na¹⁸F PET/CT scan also indicated 5(9%) patients as having equivocal findings for metastatic disease.

Discussion

- Na¹⁸F utilizes PET and CT imaging, as opposed to Single Photon Emission Computed Tomography (SPECT) used with Tc-99, contributing in part to the improved sensitivity.
- Na¹⁸F was initially approved in 1972, but withdrawn due to less expensive Tc-99.
- Limitations include a possible higher rate of false positives for Na¹⁸F scan and a higher cost.

Introduction

- The goal for imaging in castrate resistant prostate cancer (CRPC) is to detect bone metastasis early. This is crucial for patient evaluation in an era of emerging therapeutic for advanced tumors.
- However, discovery, validation, and implementation of new imaging modalities has fallen considerably behind that of new therapies for this population. The current standard for imaging was bone scintigraphy with technetium-99 (Tc-99). This detects bone metastasis at a late stage of infiltration - only after the osteoblastic reaction has occurred.
- Recent studies have illustrated that the ¹⁸F-Sodium Fluoride (Na¹⁸F) positron emission tomography (PET)/computed tomography (CT) scan is significantly more sensitive, specific and accurate in detecting bone lesions, especially earlier in the course of metastatic bone infiltration.

Table 1.
Performance of Na¹⁸F PET/CT
vs.
Tc-99 scan

	TC-99 Scan n=42	Na ¹⁸ F PET/CT Scan n=55	Reevaluation of Equivocal TC-99 Scan by Na ¹⁸ F PET/CT Scan n=8
Positive	5 (11.9%)	27 (49.1%)	3 (37.5%)
Negative	29 (69%)	23 (41.9%)	5 (62.5%)
Equivocal	8 (19%)	5 (9%)	0

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CONCLUSION

- According to our data, Na¹⁸F is more sensitive for detecting bone lesions and for delineating equivocal findings of TC-99 bone scan, where it deemed 62.5% and 37.5% of equivocal findings as positive and negative, respectively.
- Na¹⁸F PET/CT scan is a feasible option for detecting bone lesions.
- With coverage of this procedure by Medicare, patients have a more sensitive and specific tool for early diagnosis and monitoring of treatment of CRPC.
- Further standardization of Na¹⁸F PET/CT scan procedure is required to develop a semi- or fully quantitative parameters of bone disease extension.
- Future direction: include MRI modalities, diffusion weighted imaging, and pursue development of specific tracers for prostate cancer.