Total-body 68Ga-PSMA-11 PET/CT for bone metastasis detection in prostate cancer patients: Potential Impact on bone scan guidelines

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Background:

Guidelines for detecting prostate cancer (PCa) bone metastases devised by different expert panels and professional associations can vary. The SNMMI, ACR, NCCN, SUO, AUA and ASTRO recommend bone scintigraphy for initial staging of high-risk disease. They also suggest to "consider" bone scintigraphy for initial staging of intermediate-risk disease or for re-staging. There is no PSA level criteria for the re-staging indication. These guidelines contain differences in lexicon including, "should consider staging with bone scan" [Expert Opinion], "should stage with bone scan" [Clinical Principle], "may be appropriate," "may be considered (option; Grade C)," "usually appropriate" or "appropriate."

The ability of 68Ga-PSMA-11 PET/CT imaging to detect bone metastases is now well-established. However, it is unknown whether and how bone lesion incidence varies among different indications such as initial staging, biochemical recurrence, re-staging of know metastatic disease and between PSA levels or NCCN risk score.

Consistent with standard FDG protocols PSMA PET/CT images are most frequently acquired from the base of the skull to the proximal third of the femur. By contrast, bone scintigraphy and Na-F PET for PCa encompass the whole body from vertex to toes.

In this study, we determined the relationship between PSA level and the incidence of bone metastases detected by total-body 68Ga-PSMA-11 PET/CT and if expanding the ^{68}Ga-PSMA-11 PET/CT imaging field to include the vertex and lower extremities (total-body acquisition) affects bone metastasis detection rates and patient management.

Methods:

This is a retrospective analysis of 388 PCa patients enrolled in five prospective studies (NCT02940262, NCT03368547, NCT03042312, UCLA IRB#17-001336, NCT03515577). All underwent ^{68}Ga-PSMA-11 PET/CT scans acquired from vertex to toes for primary staging (n=93/388, 24%), biochemical recurrence (BCR) localization (n=225/388, 58%) or re-staging known M1 patients (n=70/388, 18%) between September 2017 and May 2018.

Results:

PSMA-positive bone lesions occurred in 12/93 (13%) of patients at initial staging, 44/225 (20%) with BCR, and 49/70 (70%) with known M1 disease. The incidence of PSMA-positive bone lesions increased with PSA levels ($p<0.001$). Levels of less than 5, 5-10, 10-20, >20 ng/ml were associated with bone lesiosn in 17.6%, 34.4%, 40.8% and 41.4% of patients, respectively ($p<0.001$).

18/388 (5%) had lesions above the superior orbital ridge and below the proximal third of the femur, respectively. There was only 1/388 patient (0.26%) in whom the total-body PET acquisition had an impact on management.

Conclusion:

Bone metastases as assessed with ^{68}Ga-PSMA-11 PET/CT are prevalent even in patients with low PSA levels. Therefore, current guidelines for bone assessments in PCa patients should be revisited as ^{68}Ga-PSMA-11 PET/CT may provide additional information for accurate bone staging at low PSA levels.

Including the total-body (from vertex to toes) for ^{68}Ga-PSMA-11 PET/CT imaging revealed additional bone lesions in 6% of patients, however, without significantly affecting patient management.

Conflict of interest:

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Johannes Czernin is a founder, board member, and holds equity in Sofie Biosciences and Trethera Therapeutics. Intellectual property patented by the University of California is licensed to Sofie Biosciences and Trethera Therapeutics. Johannes Czernin serves on the medical advisory board of Actinium and is a member of the VISION trial steering committee, a clinical trial sponsored by Endocyte.