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Clinical vignette

Radiopharmaceutical for detecting PSMA — positive metastatic colon cancer: Matched-pair comparison of ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA PET/MRI

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Abstract

Prostate-specific membrane antigen (PSMA) — based radiopharmaceuticals are promising for the evaluation of PSMA-positive non-prostate cancers. In this case study, ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA positron emission tomography/magnetic resonance imaging (PET/MRI) were compared in a patient with metastatic colon cancer. Both ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA PET/MRI showed biopsy-proven metastatic left external iliac adenopathy, highlighting the feasibility of PSMA uptake in PET/MRI of metastatic nodal disease from colon cancer. Along with imaging evaluation, PSMA-based radiopharmaceuticals may also be used as a surrogate imaging tracer for potential theranostic applications using alpha or beta emitters in the context of PSMA-directed radiopharmaceutical therapy in advanced and progressive colorectal cancer.

KEY words: ^{18}F-BF3-Cy3-ACUPA; ^{68}Ga-PSMA; colorectal cancer; PET/MRI; PSMA

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Prostate-specific membrane antigen (PSMA) — based radiopharmaceuticals are promising for the evaluation of PSMA-positive non-prostate cancers. In this case study, ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA positron emission tomography/magnetic resonance imaging (PET/MRI) were compared in a patient with metastatic colon cancer. A 57-year-old man underwent prostate-specific membrane antigen (PSMA) imaging for restaging of his colon cancer. Previously, he had been diagnosed with adenocarcinoma in the colon, undergone resection, and received chemotherapy; he developed nodal metastatic disease and received immunotherapy prior to PSMA imaging. To further evaluate the metastatic disease, he was enrolled in and provided informed consent for a clinical trial of ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA positron emission tomography/magnetic resonance imaging (PET/MRI) approved by the institutional review board. ^{68}Ga-PSMA PET/MRI for metastatic workup showed mildly increased radiotracer avidity in the left external iliac region on the

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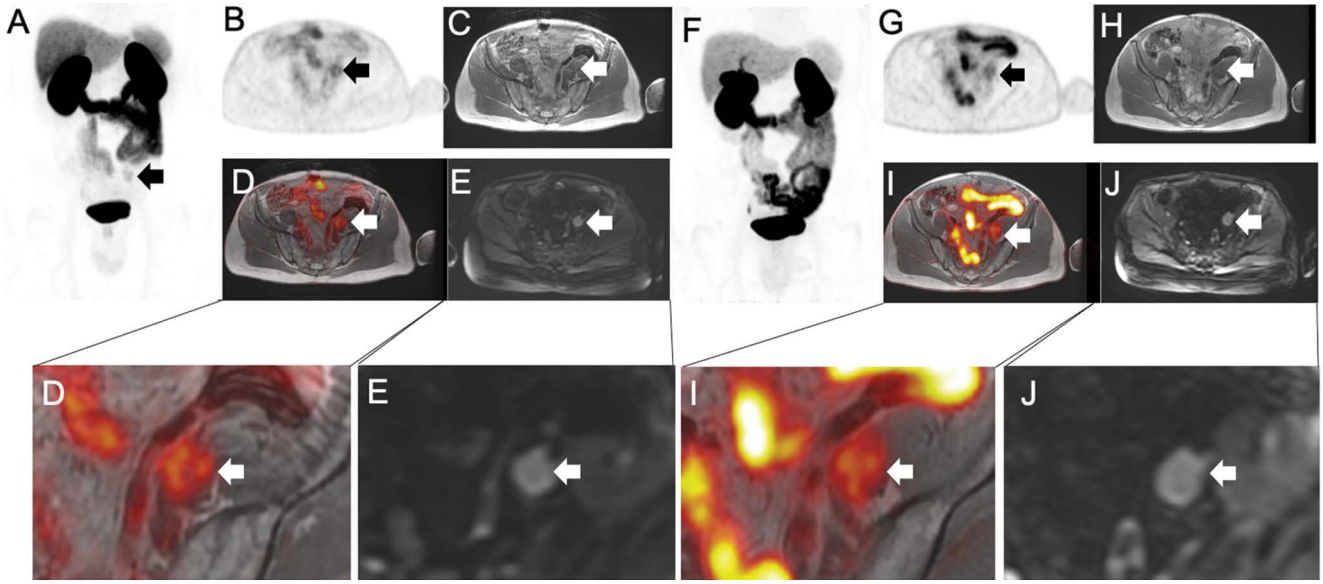

Figure 1. ^{68}Ga-PSMA PET/MRI showed mildly increased radiotracer avidity in the left external iliac region on the body maximum intensity projection (MIP) image (**A**, arrow), which was localized to moderate radiotracer uptake (**B**, arrow, PET) in the enlarged left external iliac node (**C**, MRI) (**D**, fused PET/MRI) with restricted diffusion (**E**, arrow, diffusion-weighted imaging (DWI)). ^{18}F-BF3-Cy3-ACUPA PET/MRI showed increased abnormal radiotracer avidity in the left iliac node (**F**, body MIP; difficult to delineate due to overlying bowel activity; **G**, arrow, PET and **H**, MRI and **I**, fused PET/MRI) with restricted diffusion (**J**, arrow, DWI MRI).

body maximum intensity projection (MIP) image (Fig. 1A, arrow), which was localized to moderate radiotracer uptake (Fig. 1B, arrow, PET; SUVmax, 3.4; liver background activity, SUV mean, 4.6 and blood pool activity, SUV mean, 0.7) in the enlarged left external iliac node (Fig. 1C, MRI) (Fig. 1D, fused PET/MRI) with restricted diffusion [Fig. 1E, arrow, diffusion-weighted imaging (DWI)]. Two weeks later, ^{18}F-BF3-Cy3-ACUPA was performed to confirm the previous findings on ^{68}Ga-PSMA PET/MR [1]. ^{18}F-BF3-Cy3-ACUPA PET/MRI showed increased abnormal radiotracer avidity in the left iliac node (Fig. 1F, body MIP; difficult to delineate due to overlying bowel activity; Fig. 1G, arrow, PET and Fig. 1H, MRI and Fig. 1I, fused PET/MRI; SUVmax, 3.2; liver background activity, SUV mean, 3.5 and blood pool activity, SUV mean, 0.8) with restricted diffusion (Fig. 1J, arrow, DWI MRI). To our knowledge, we here display the first clinical images of matched-pair comparison of ^{18}F-BF3-Cy3-ACUPA and ^{68}Ga-PSMA PET/MRI in a patient with metastatic colon cancer. Several case reports have reported PSMA avidity in colorectal cancer, potentially supporting PSMA-targeted peptide receptor radionuclide therapy (PRRT) in advanced colorectal cancer [2–4] However, in a recent report with 10 patients with metastatic colorectal cancer, ^{68}Ga-PSMA-11 PET/CT was not sensitive enough to detect metastatic colorectal cancer, indicating that it is not as promising for PSMA-PRRT [5]. Along with imaging evaluation, PSMA-based radiopharmaceuticals may also be used as a surrogate imaging tracer for potential theranostic applications using alpha or beta emitters in the context of PSMA-directed radiopharmaceutical therapy in advanced and progressive colorectal cancer.

Conflict of interest

Richard Ting and Omer Aras are minor stakeholders in Trace Imaging Technologies. The other authors declare that they have no conflict of interest.

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