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## Detection of $^{18}\text{F}$ -FDG PET/CT Occult Lesions with $^{18}\text{F}$ -DCFPyL PET/CT in a Patient with Metastatic Renal Cell Carcinoma

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### Abstract

Renal cell carcinoma (RCC) is common with more than 60,000 new cases in the United States yearly. No curative therapies are available for metastatic RCC. Improved methods of imaging metastatic RCC would be of value in identifying sites of occult disease and potentially for judging response to therapy. A 58-year-old male with known metastatic clear cell RCC was imaged with both  $^{18}\text{F}$ -FDG and  $^{18}\text{F}$ -DCFPyL PET/CT.  $^{18}\text{F}$ -DCFPyL is a small molecule inhibitor of the prostate-specific membrane antigen (PSMA), a target known to be highly expressed on solid tumor neovasculature. Relative to  $^{18}\text{F}$ -FDG,  $^{18}\text{F}$ -DCFPyL identified more lesions and demonstrated higher tumor radiotracer uptake.

### Keywords

Metastatic renal cell carcinoma; prostate-specific membrane antigen (PSMA); PET/CT

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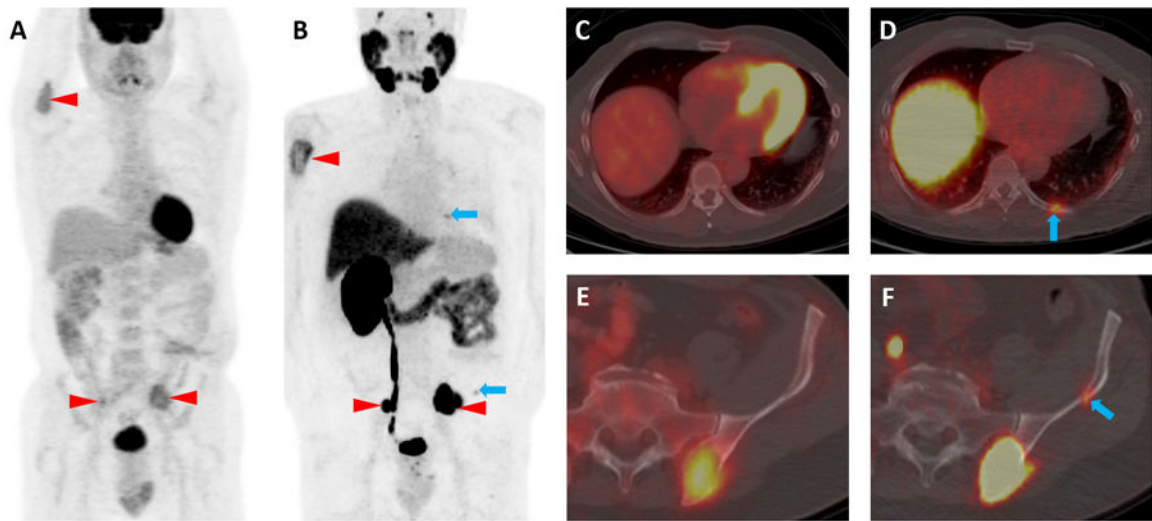
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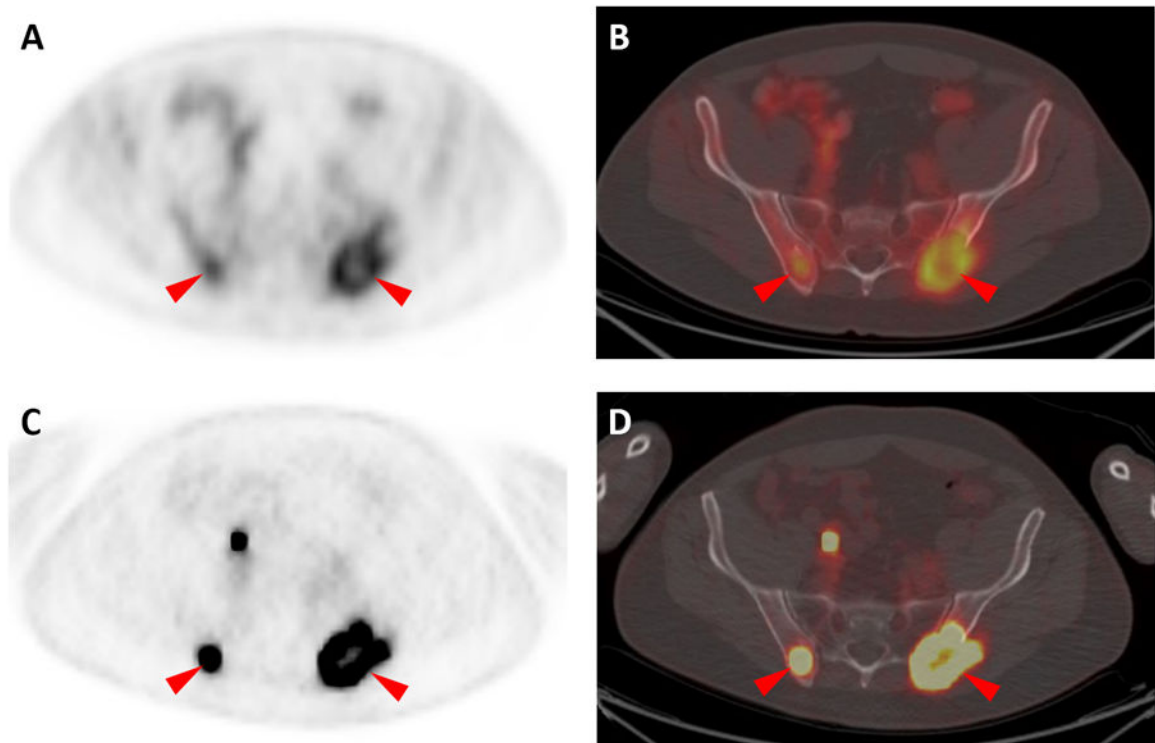
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**Figure 1.**

A 58-year-old male patient with known clear cell RCC metastases to the skeleton was imaged contemporaneously with two PET/CT examinations, one with  $^{18}\text{F}$ -FDG and a second with  $^{18}\text{F}$ -DCFPyL, a small molecule inhibitor of PSMA. The maximum intensity projection images from the two examinations ( $^{18}\text{F}$ -FDG, **A**, and  $^{18}\text{F}$ -DCFPyL, **B**) demonstrate concordance of multiple radiotracer-avid lesions including the proximal right humerus and both iliac bones (red arrowheads). However, additional subtle sites of  $^{18}\text{F}$ -DCFPyL uptake are noted that do not have corresponding  $^{18}\text{F}$ -FDG uptake (blue arrows). These sites include subtle endosteal scalloping of the left posterior ninth rib and the left iliac bone without accompanying  $^{18}\text{F}$ -FDG uptake (**C** and **E**, blue arrows). In contrast, the axial  $^{18}\text{F}$ -DCFPyL PET/CT images demonstrated moderate radiotracer uptake at these sites (**D**,  $\text{SUV}_{\text{max}}$  (lean body mass corrected) 3.2, blue arrow and **F**,  $^{18}\text{F}$ -DCFPyL  $\text{SUV}_{\text{max}}$  2.7, blue arrow).



**Figure 2.**

Large lytic lesions were present in the posterior aspects of both iliac bones in this patient, and both sites were found to have intense uptake of both radiotracers ( $^{18}\text{F}$ -FDG in **A** and **B** and  $^{18}\text{F}$ -DCFPyL in **C** and **D**, red arrowheads). However,  $^{18}\text{F}$ -DCFPyL uptake was both visually and quantitatively higher than  $^{18}\text{F}$ -FDG. For the right iliac lesion,  $^{18}\text{F}$ -FDG uptake yielded  $\text{SUV}_{\text{max}}$  of 3.3, while for the same lesion  $^{18}\text{F}$ -DCFPyL uptake generated  $\text{SUV}_{\text{max}}$  of 16.6. For the left iliac,  $^{18}\text{F}$ -FDG  $\text{SUV}_{\text{max}}$  was 4.0 while  $^{18}\text{F}$ -DCFPyL  $\text{SUV}_{\text{max}}$  was 13.9. In aggregate, our findings in this patient with metastatic clear cell RCC are suggestive that  $^{18}\text{F}$ -DCFPyL may be able to identify more lesions and has higher tumor uptake than  $^{18}\text{F}$ -FDG. Although a significant body of work has examined the role of  $^{18}\text{F}$ -DCFPyL and other small molecule inhibitors targeted against PSMA in the detection of prostate cancer [1-4], the use of such radiotracers for non-prostate applications has been limited to date [5, 6]. This is despite the fact that PSMA is highly expressed on the tumor neovasculature of many solid tumors, including RCC [7, 8]. Indeed, a previous case report has demonstrated the ability of a  $^{68}\text{Ga}$ -labeled small molecule inhibitor of PSMA ( $^{68}\text{Ga}$ -PSMA) to identify sites of disease in a patient with metastatic clear cell RCC [5]. In that report, the authors noted concordance between  $^{18}\text{F}$ -FDG and  $^{68}\text{Ga}$ -PSMA uptake for all described lesions, though the  $^{68}\text{Ga}$ -PSMA PET acquisition was notable for improved lesion conspicuity. In combination with the earlier findings utilizing  $^{68}\text{Ga}$ -PSMA, this report confirms that further study with PSMA radiotracers in metastatic RCC is warranted.