[^{68} Ga]Ga-FAPI versus [^{18}F]F-FDG in malignant melanoma: complementary or counterpoint?

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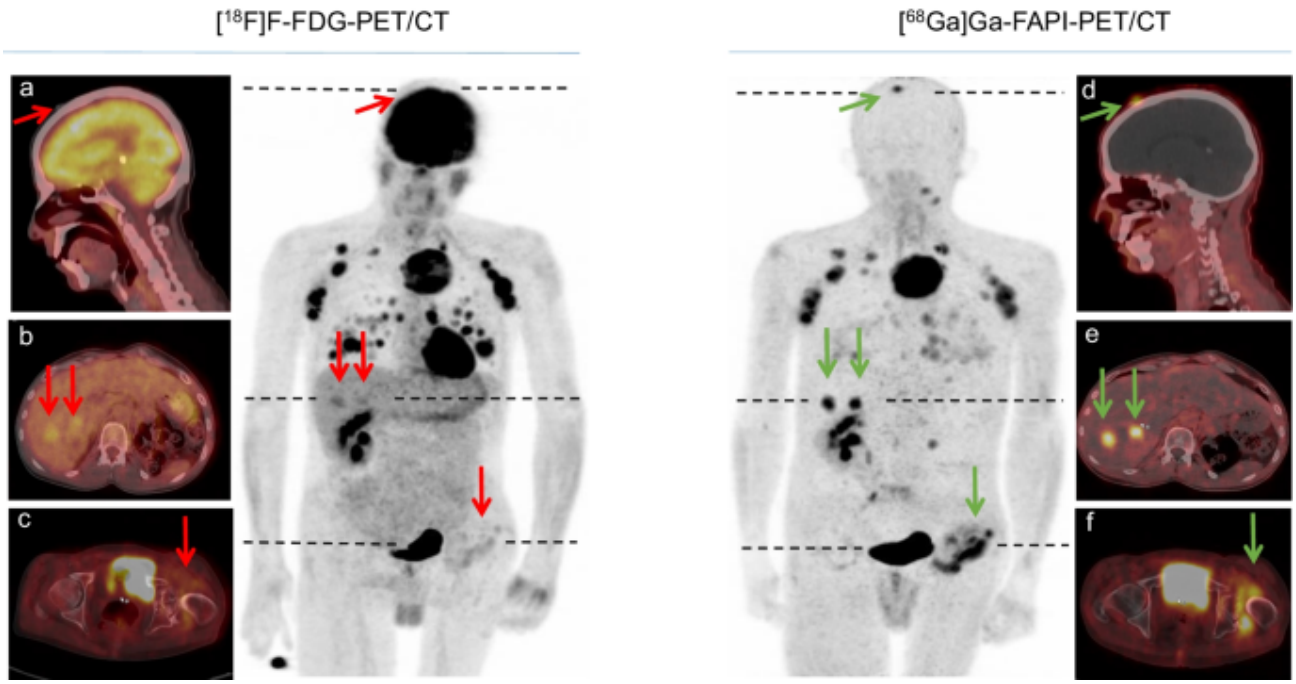
Fibroblast activation protein (FAP) is a type II transmembrane serine protease overexpressed by cancer-associated fibroblasts in the tumor microenvironment [1, 2]. FAP modulates tumor growth and invasion and is overexpressed by various epithelial cancer types including reactive stromal fibroblasts of both primary and metastatic melanomas [3]. By exploiting the overexpression by the stroma cells in tumors of epithelial origin, the development of quinolone-based molecules for FAP–based imaging ([^{68}Ga]Ga-FAPI) as a novel pan-cancer tracer has opened a new era in the oncological imaging with very promising results [4,5,6]. However, to our knowledge, this is the first investigation of FAP-ligand in a patient with malignant melanoma.

This image presents a 41-year-old male with a histologically confirmed advanced cutaneous malignant melanoma (S100: positive; HMB45: positive; Ki67: 10–20%; Breslow: 4 mm; 8 mitosis/mm^2) with multi-organ metastases.

The patient underwent [^{18}F]F-FDG and ^{68}Ga[Ga]-FAPI PET/CT scans consecutively with a time interval of 6 days for initial staging.

The most metastatic lesions with equivocal or rather moderate FDG-uptake demonstrated a remarkable intense FAPI-uptake. The hepatic metastases (b (lesion SUV_{max}/liver SUV_{max}: 3,1/4,0) vs. e (SUV_{max} lesion/SUV_{max} liver: 6,1/1,5) demonstrate very intense FAPI-uptake with a very preferable tumor-to-background ratio. In addition, the cutaneous metastasis on the skull skin (a, d (SUV_{max}: 5,1)) could only be detected on FAPI PET imaging, while lung metastases demonstrated only moderate FAP-uptake compared to FDG. There was discordance in the uptake in the soft tissues around the left femoral head (c (SUV_{max} 2,5) vs. f (SUV_{max}: 7,4)).



Thus, this case demonstrates the complementary and in some parts superior role of [^{68}Ga]Ga-FAPI to the current onco-PET tracer in patients with malignant melanoma. While both [^{18}F]F-FDG and [^{68}Ga]Ga-FAPI are not tumor-specific, further work is needed to confirm the pathophysiological basis of the differences in tumor uptake between these two tracers, as demonstrated here. Further studies invite the exploration of FAP-targets and its possible theranostics applications.

Data availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics declarations

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Approval was granted by the Ethics Committee of University of Pretoria (Nr. 881/2019).

Consent to participate

The patient gave informed consent to using clinical data for research and scientific purposes.

Consent for publication

The patient gave signed consent to using clinical data for scientific purposes. Informed consent was obtained from the patient for publication of his case/report and accompanying images.

Conflict of interest

FLG has a patent application for quinolone-based FAP-targeting agents for imaging and therapy in nuclear medicine and shares of iTheranostics. Furthermore, FLG is a medical advisor for ABX Advanced Biochemical Compound and Telix Pharmaceuticals. The other authors have no relevant financial or non-financial interests to disclose.

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