

¹⁷⁷Lu-FAPI Therapy in a Patient With End-Stage Metastatic Pancreatic Adenocarcinoma

Fatemeh Kaghazchi, MD,* Ramin Akbarian Aghdam, MD,† Shirin Haghighi, MD,‡
Reza Vali, MD, MSc,§ and Zohreh Adinehpour, MD*

Abstract: A 52-year-old woman with metastatic pancreatic adenocarcinoma underwent imaging with ¹⁸F-FDG PET/CT and ⁶⁸Ga-FAPI-46 PET/CT, which demonstrated malignancy recurrence in the surgical bed with multiple metastatic lesions, more extensive on ⁶⁸Ga-FAPI-46 PET/CT. The patient was a candidate for therapy with ¹⁷⁷Lu-FAPI-46 due to high uptake of lesions in ⁶⁸Ga-FAPI-46 images and no other available therapeutic option. Posttreatment ¹⁷⁷Lu-FAPI-46 scans showed rather rapid washout of the radiopharmaceutical from tumoral lesions. This case report suggests that, although ⁶⁸Ga-FAPI-46 is a promising agent for tumor imaging, ¹⁷⁷Lu-FAPI-46 may not be an optimal compound for theranostic applications.

Key Words: ⁶⁸Ga-FAPI-46, ¹⁸F-FDG, PET/CT, pancreatic cancer, ¹⁷⁷Lu-FAPI-46

(*Clin Nucl Med* 2022;47: e243–e245)

Received for publication June 29, 2021; revision accepted October 15, 2021.
From the *Departments of PET/CT, Khatam Hospital, Tehran, Iran; †Nuclear Medicine and Molecular Imaging; ‡Oncology, Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran; and §University of Toronto, Toronto, Ontario, Canada.

Conflicts of interest and sources of funding: none declared.

Correspondence to: Reza Vali, MD, MSc, Diagnostic Imaging Department, The Hospital for Sick Children, 555 University Ave, Toronto, ON M5G 1X8, Canada. E-mail: reza.vali@sickkids.ca.

Copyright © 2022 Wolters Kluwer Health, Inc. All rights reserved.

ISSN: 0363-9762/22/4703–e243

DOI: 10.1097/RLU.0000000000004021

REFERENCES

- Chen H, Pang Y, Wu J, et al. Comparison of [⁶⁸Ga]Ga-DOTA-FAPI-04 and [¹⁸F] FDG PET/CT for the diagnosis of primary and metastatic lesions in patients with various types of cancer. *Eur J Nucl Med Mol Imaging*. 2020;47: 1820–1832.
- Luo Y, Pan Q, Zhang W, et al. Intense FAPI uptake in inflammation may mask the tumor activity of pancreatic cancer in ⁶⁸Ga-FAPI PET/CT. *Clin Nucl Med*. 2020;45:310–311.
- Hamson EJ, Keane FM, Tholen S, et al. Understanding fibroblast activation protein (FAP): substrates, activities, expression and targeting for cancer therapy. *Proteomics Clin Appl*. 2014;8:454–463.
- Siveke JT. Fibroblast-activating protein: targeting the roots of the tumor microenvironment. *J Nucl Med*. 2018;59:1412–1414.
- Cohen SJ, Alpaugh RK, Palazzo I, et al. Fibroblast activation protein and its relationship to clinical outcome in pancreatic adenocarcinoma. *Pancreas*. 2008;37:154–158.
- Zhao L, Gu J, Fu K, et al. ⁶⁸Ga-FAPI PET/CT in assessment of liver nodules in a cirrhotic patient. *Clin Nucl Med*. 2020;45:430–432.
- Giesel FL, Kratochwil C, Lindner T, et al. ⁶⁸Ga-FAPI PET/CT: biodistribution and preliminary dosimetry estimate of 2 DOTA-containing FAP-targeting agents in patients with various cancers. *J Nucl Med*. 2019;60:386–392.
- Luo Y, Pan Q, Yang H, et al. Fibroblast activation protein-targeted PET/CT with ⁶⁸Ga-FAPI for imaging IgG4-related disease: comparison to ¹⁸F-FDG PET/CT. *J Nucl Med*. 2021;62:266–271.
- Loktev A, Lindner T, Mier W, et al. A tumor-imaging method targeting cancer-associated fibroblasts. *J Nucl Med*. 2018;59:1423–1429.

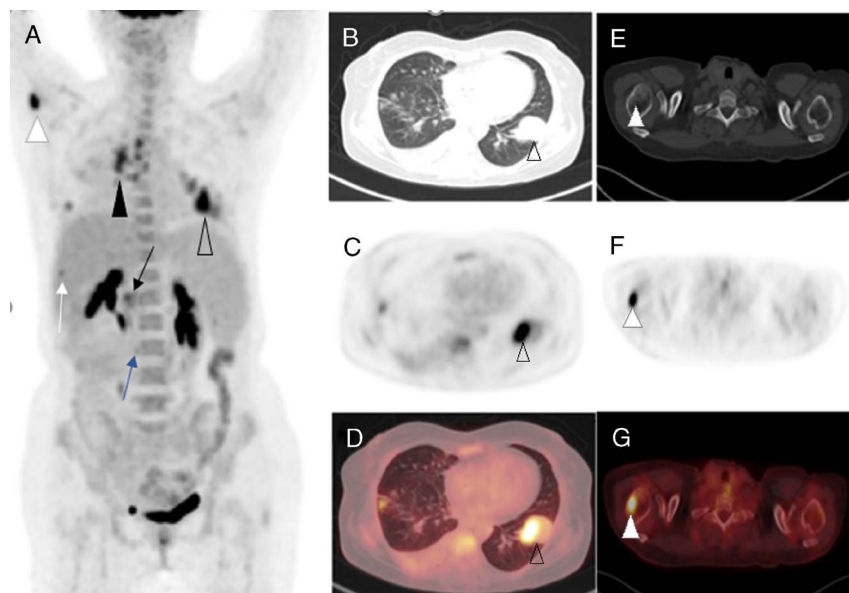


FIGURE 1. A 52-year-old woman with a history of adenocarcinoma of the ampulla of Vater who underwent partial pancreatectomy and chemotherapy was referred for ^{18}F -FDG PET/CT scan. The MIP image of ^{18}F -FDG PET (A) showing tumor recurrence (black arrow) as well as metastases in the lungs (blank arrowhead), mediastinal (black arrowhead) and retroperitoneal lymph nodes (blue arrow), liver (white arrow), and right humerus (white arrowhead). Axial view images showing pulmonary metastasis (B, CT; C, PET; D, fused PET/CT) and metastasis to the right humerus (E, CT; F, PET; G, fused PET/CT).

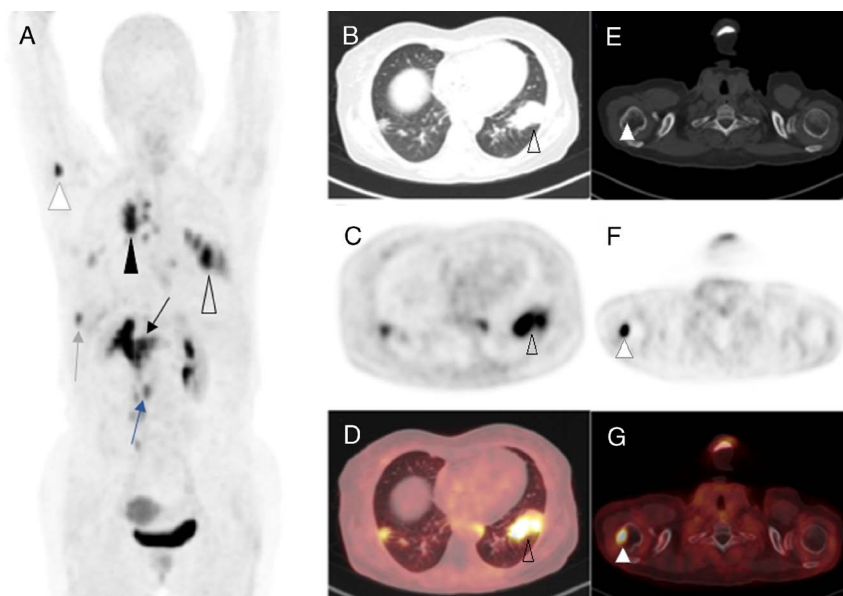


FIGURE 2. Because of progressive disease and no other available approved treatment, the patient underwent ^{68}Ga -FAPI-46 PET/CT scan within 2 weeks of the ^{18}F -FDG PET/CT scan to evaluate for a possible ^{177}Lu -FAPI-46 therapy. The MIP image of ^{68}Ga -FAPI-46 PET (A) showing local recurrence (black arrow) and metastatic disease in the right humerus (white arrowhead), lungs (blank arrowhead), mediastinal (black arrowhead) and retroperitoneal (blue arrow) lymph nodes, and liver (gray arrow). Axial view images showing pulmonary metastasis (B, CT; C, PET; D, fused PET/CT) and metastasis to the right humerus (E, CT; F, PET; G, fused PET/CT).

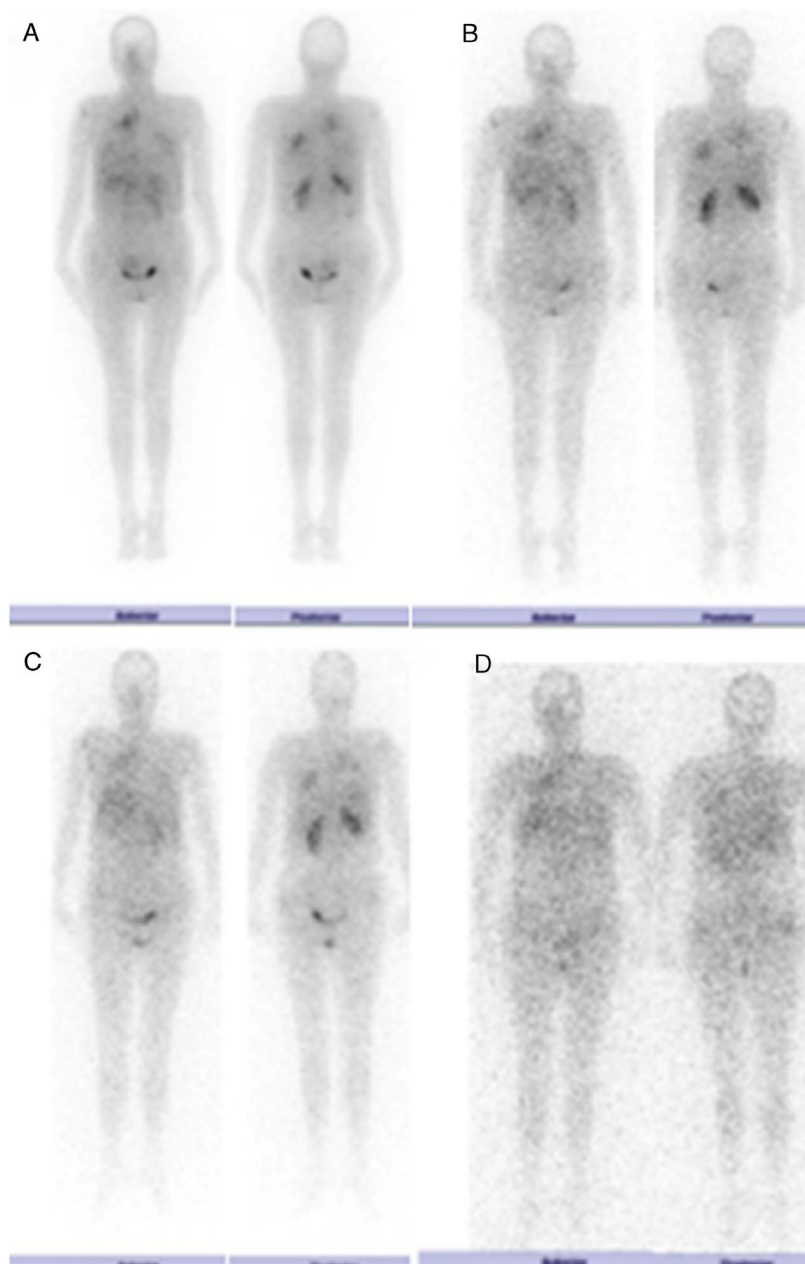


FIGURE 3. After significant uptake of ^{68}Ga -FAPI-46 in tumoral lesions, the patient was a candidate for ^{177}Lu -FAPI-46 therapy. This therapy registered under our institutional review board, and written informed consent was obtained from the patient. The patient was treated with 1850 MBq ^{177}Lu -FAPI-46, and subsequent posttreatment scans were obtained with 24 hours' intervals for 6 days. ^{177}Lu -FAPI-46 scans in anterior and posterior views (A, first day; B, second day; C, third day; D, sixth day) showed high uptake of ^{177}Lu -FAPI-46 within the tumoral lesions initially with gradual decrease in uptake in subsequent scans as the scans after 6 days showed near-complete radiotracer washout. In the follow-up visits, the patient showed transient reduction in the right shoulder pain after 1 week of the therapy, but increase in pain and tumor markers after 2 weeks' posttreatment. Eventually, the patient passed away after 45 days of treatment. Several studies discussed the superior diagnostic efficacy, higher detection rate, and uptake of ^{68}Ga -FAPI-46 imaging compared with ^{18}F -FDG with excellent tumor-to-background radiotracer uptake.¹⁻⁹ Almost negligible uptake of the ^{68}Ga -FAPI-46 in the brain, liver, and oral cavity makes it a promising imaging radiotracer.⁷ FAPI is a theranostic agent and can be used for therapeutic purposes. To our knowledge, this report is the first published case of therapy with ^{177}Lu -FAPI-46 in a patient with end-stage pancreatic adenocarcinoma. Our limited experience with ^{177}Lu -FAPI-46 showed that, despite high uptake of FAPI in tumoral lesions and its higher detection rate compared with ^{18}F -FDG, due to its rapid washout from tumoral lesions, ^{177}Lu -FAPI-46 therapy must be further analyzed for considering as a therapeutic option in patients with advanced metastatic pancreatic adenocarcinoma. Subsequent studies with more stable FAPI compounds or implying radiopharmaceuticals with shorter half-life such as ^{188}Re and ^{186}Re are recommended.