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^{68}Ga-FAPI and ^{18}F-FDG PET/CT Images in a Patient With Extrapulmonary Tuberculosis Mimicking Malignant Tumor

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Abstract: Extrapulmonary tuberculosis (TB) is difficult to diagnose. Here, we report a case of extrapulmonary TB in a 68-year-old woman presented with mental fatigue, poor appetite, and weight loss. ^{18}F-FDG PET/CT revealed elevated ^{18}F-FDG uptake in the left inferior cervical, left supraclavicular, mediastinal, and splenic hilum lymph nodes and spleen, which were suspected of malignant tumor. To further differentiate benign and malignant diseases, ^{68}Ga-FAPI PET/CT was performed. ^{68}Ga-FAPI PET/CT also showed intense ^{68}Ga-FAPI uptake in the previously mentioned FDG-avid lesions. However, biopsy of the left supraclavicular lymph node demonstrated the presence of TB.

Key Words: tuberculosis, ^{18}F-FDG, ^{68}Ga-FAPI, PET/CT

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REFERENCES

1. Loktev A, Lindner T, Mier W, et al. A tumor-imaging method targeting cancer-associated fibroblasts. *J Nucl Med*. 2018;59:1423–1429.
2. Lindner T, Loktev A, Altmann A, et al. Development of quinoline-based theranostic ligands for the targeting of fibroblast activation protein. *J Nucl Med*. 2018;59:1415–1422.
3. Loktev A, Lindner T, Burger EM, et al. Development of fibroblast activation protein-targeted radiotracers with improved tumor retention. *J Nucl Med*. 2019;60:1421–1429.
4. Kratochwil C, Flechsig P, Lindner T, et al. (68)Ga-FAPI PET/CT: tracer uptake in 28 different kinds of cancer. *J Nucl Med*. 2019;60:801–805.
5. Giesel FL, Kratochwil C, Lindner T, et al. (68)Ga-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.
6. Meyer C, Dahlbom M, Lindner T, et al. Radiation dosimetry and biodistribution of ^{68}Ga-FAPI-46 PET imaging in cancer patients. *J Nucl Med*. 2020;61: 1171–1177.
7. Luo Y, Pan Q, Zhang W, et al. Intense FAPI uptake in inflammation may mask the tumor activity of pancreatic cancer in (68)Ga-FAPI PET/CT. *Clin Nucl Med*. 2020;45:310–311.
8. Pan Q, Luo Y, Zhang W. Recurrent immunoglobulin G4-related disease shown on (18)F-FDG and (68)Ga-FAPI PET/CT. *Clin Nucl Med*. 2020;45: 312–313.

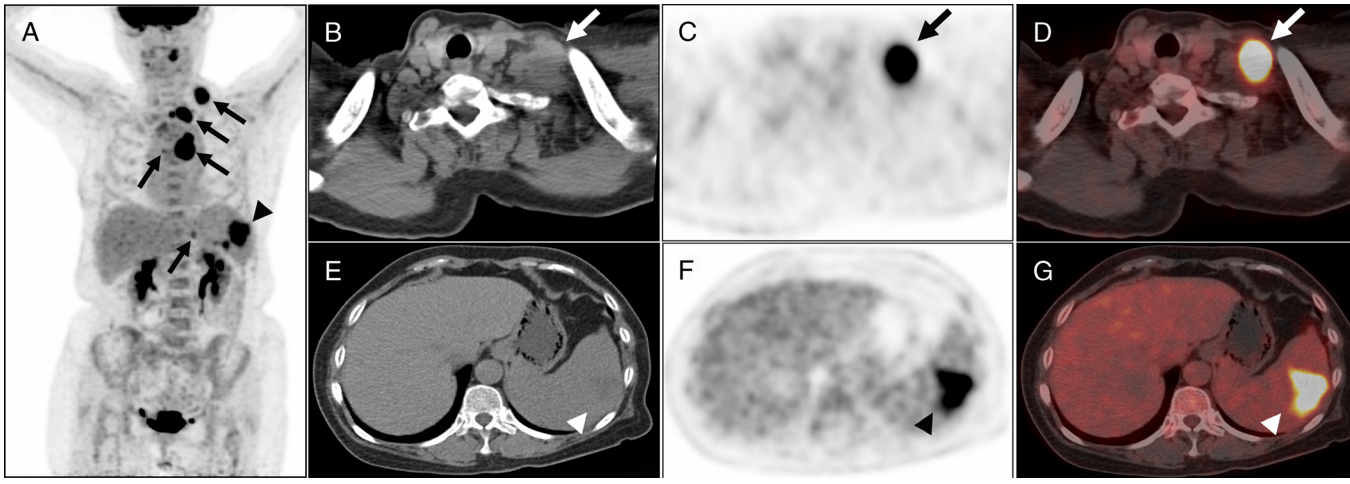

FIGURE 1. A 68-year-old woman presented with mental fatigue, poor appetite, and weight loss for 1 month. In addition, physical examination revealed enlarged left supraclavicular lymph node. She had no fever, cough, expectoration, or nighttime sweating. Her leukocyte count was 18.1 $\times$ 10^9/L (reference, 3.5–9.5 $\times$ 10^9/L), neutrophil count was 14.5 $\times$ 10^9/L (reference, 1.8–6.3 $\times$ 10^9/L), platelet count was 672 $\times$ 10^9/L (reference, 125–350 $\times$ 10^9/L), and serum creatinine level was within the reference range. ^{18}F-FDG PET/CT was performed to aid in diagnosis. As showed in MIP of ^{18}F-FDG PET, elevated ^{18}F-FDG uptake in left inferior cervical, left supraclavicular, mediastinal, and splenic hilum lymph nodes (**A**, arrows), and spleen (**A**, arrowhead) were revealed. Representative lymph node (**B**–**D**, arrows; SUV_{max}, 16.9) and spleen lesions (**E**–**G**, arrowhead; SUV_{max}, 12.0) in the axial CT, PET, and fusion PET/CT images were exhibited. However, it is not easy to make a diagnosis with ^{18}F-FDG PET/CT only.

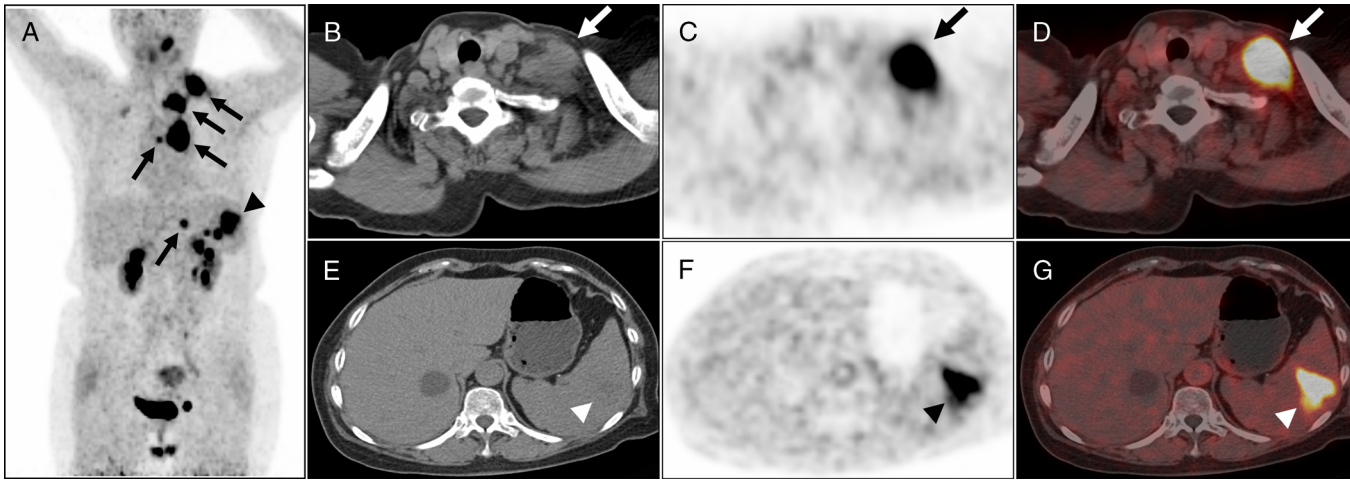

FIGURE 2. ^{68}Ga-FAPI PET/CT was performed to further differentiate benign and malignant diseases. The patient was enrolled in the prospective study evaluating the role of ^{68}Ga-FAPI PET/CT in the management of malignant tumors, which was approved by Shanghai Cancer Center Institutional Review Board (ID 2004216-25), and written informed consent was obtained from the patient. The MIP, axial CT, PET, and fusion PET/CT images of ^{68}Ga-FAPI PET/CT showed intense ^{68}Ga-FAPI uptake in the aforementioned FDG-avid lymph nodes (**A**–**D**; arrows, SUV_{max}, 20.1) and spleen lesions (**A**, **E**–**G**, arrowhead; SUV_{max}, 11.7). According to the results of ^{18}F-FDG and ^{68}Ga-FAPI PET/CT, the most likely diagnosis was malignant tumor.

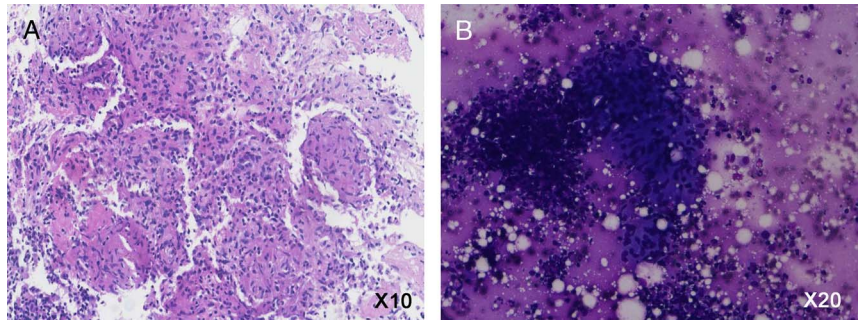

FIGURE 3. However, biopsy of the left supraclavicular lymph node demonstrated the presence of tuberculosis (TB). Granulomatous nodules composed of epithelioid cells, caseous necrosis, and inflammatory cells or lymphocytes were observed in microscopic section of hematoxylin-eosin stain (**A**, original magnification ×10) and Liu's stain (**B**, original magnification ×20). The ^{68}Ga-FAPI is developed to detect the expression of fibroblast activation protein (FAP).[1–3] FAP is an overexpression in more than 90% of epithelial carcinomas and some mesenchymal tumors, and recent studies showed that ^{68}Ga-FAPI might be a broad-spectrum tumor PET agent.[4–6] However, high uptake of ^{68}Ga-FAPI was also found in nontumorous lesions, including wound healing, inflammation, fibrosis, and so on.[7,8] This case again highlighted that ^{68}Ga-FAPI could gather in nontumorous lesions. Even so, the positive founding of ^{68}Ga-FAPI in extrapulmonary TB lesions indicates that ^{68}Ga-FAPI could serve as a probe in diagnosis and response evaluation of TB.