OPEN

^{18}F-FBPA PET in Sarcoidosis

Comparison to Inflammation-Related Uptake on FDG PET

Tadashi Watabe, MD, PhD,† Hiroaki Shimamoto, DDS, PhD,‡ Sadahiro Naka,§ Takashi Kamiya, PhD,§ and Shumei Murakami, DDS, PhD‡*

Abstract: A 68-year-old man with sarcoidosis showed high ^{18}F-FDG uptake in the mediastinal and hilar lymph nodes on ^{18}F-FDG PET, suggesting active inflammation. ^{18}F-fluoro-boronophenylalanine (FBPA) PET showed no significant uptake in the mediastinal and hilar lymph nodes, suggesting its cancer specificity as a substrate of L-type amino acid transporter 1. ^{18}F-fluoro-boronophenylalanine PET can be used for precise evaluation in oncology when the differentiation between inflammation and metastasis is inconclusive on ^{18}F-FDG PET.

Key Words: ^{18}F-FBPA, ^{18}F-FDG, sarcoidosis

(*Clin Nucl Med* 2020;45: 863–864)

Received for publication April 16, 2020; revision accepted July 26, 2020.

From the *Department of Nuclear Medicine and Tracer Kinetics, Graduate School of Medicine, †Institute for Radiation Sciences, and ‡Department of Oral and Maxillofacial Radiology, Graduate School of Dentistry, Osaka University; §Department of Radiology, Osaka University Hospital, Osaka University, Suita, Japan.

Conflicts of interest and sources of funding: none declared.

Correspondence to: Tadashi Watabe, MD, PhD, Department of Nuclear Medicine and Tracer Kinetics, Graduate School of Medicine, Osaka University, 2-2 Yamadaoka, Suita, Osaka 565-0871, Japan. E-mail: watabe@tracer.med.osaka-u.ac.jp.

ISSN: 0363-9762/20/4511–0863
DOI: 10.1097/RLU.0000000000003274

REFERENCES

1. Watabe T, Ikeda H, Nagamori S, et al. ^{18}F-FBPA as a tumor-specific probe of L-type amino acid transporter 1 (LAT1): a comparison study with ^{18}F-FDG and ^{11}C-methionine PET. *Eur J Nucl Med Mol Imaging*. 2017;44:321–331.
2. Beshr R, Isohashi K, Watabe T, et al. Preliminary feasibility study on differential diagnosis between radiation-induced cerebral necrosis and recurrent brain tumor by means of [(^{18})F]fluoro-borono-phenylalanine PET/CT. *Ann Nucl Med*. 2018;32:702–708.
3. Yoshimoto M, Kurihara H, Honda N, et al. Predominant contribution of L-type amino acid transporter to 4-borono-2-(18)F-fluoro-phenylalanine uptake in human glioblastoma cells. *Nucl Med Biol*. 2013;40:625–629.
4. Aoki M, Watabe T, Nagamori S, et al. Distribution of LAT1-targeting PET tracer was independent of the tumor blood flow in rat xenograft models of C6 glioma and MIA PaCa-2. *Ann Nucl Med*. 2019;33:394–403.
5. Kanai Y, Segawa H, Miyamoto K, et al. Expression cloning and characterization of a transporter for large neutral amino acids activated by the heavy chain of 4F2 antigen (CD98). *J Biol Chem*. 1998;273:23629–23632.
6. Wiriyasermkul P, Nagamori S, Tominaga H, et al. Transport of 3-fluoro-L-alpha-methyl-tyrosine by tumor-upregulated L-type amino acid transporter 1: a cause of the tumor uptake in PET. *J Nucl Med*. 2012;53:1253–1261.
7. Wei L, Tominaga H, Ohgaki R, et al. Specific transport of 3-fluoro-L-alpha-methyl-tyrosine by LAT1 explains its specificity to malignant tumors in imaging. *Cancer Sci*. 2016;107:347–352.
8. Yudistiro R, Arisaka Y, Tokue A, et al. Differentiation of sarcoidosis-lymphoma syndrome lesions: a case report on the use of two different positron emission tomography tracers. *BMC Med Imaging*. 2016;16:1.

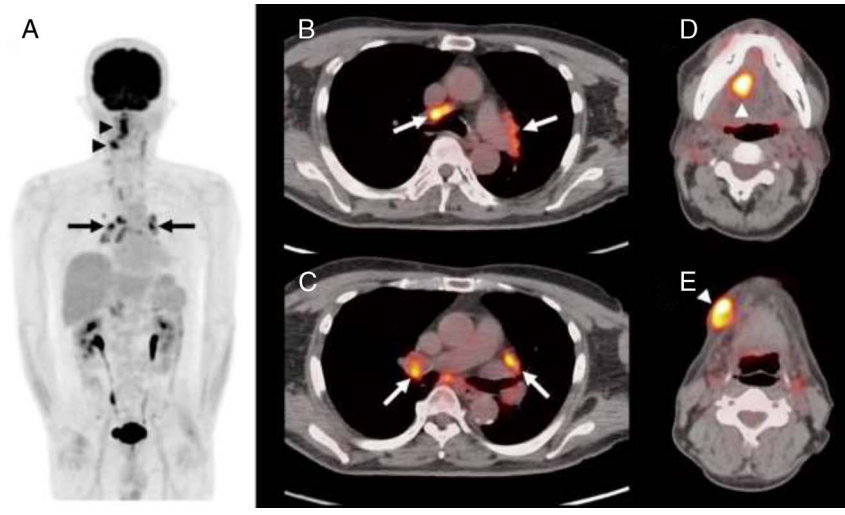

FIGURE 1. A 68-year-old man with tongue cancer and sarcoidosis underwent high-dose-rate interstitial brachytherapy to the primary cancer lesion (54 Gy/9 fr). Ten days later, ^{18}F-FDG PET revealed high FDG uptakes in the mediastinal and hilar lymph nodes, suggesting active inflammation in a sarcoidosis granuloma (**A**–**C**, arrows; SUV_{max}, 8.05). In addition, ^{18}F-FDG uptake was also seen in the pathway of the applicator implantation and radiation-induced inflammation, which was not observed in the pretreatment ^{18}F-FDG PET (**D** and **E**, arrowheads). Uptake in the primary tumor region was not clear.

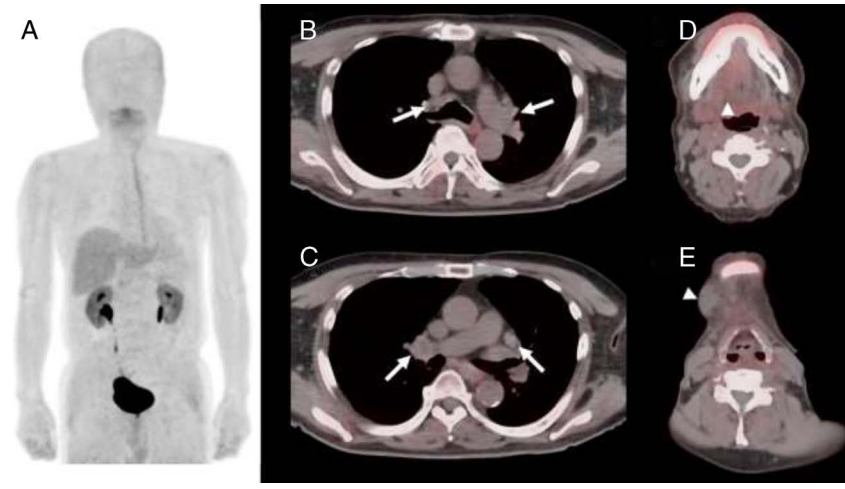

FIGURE 2. The following day after ^{18}F-FDG PET, ^{18}F-fluoro-boronophenylalanine (FBPA) PET was performed. No significant FBPA uptake was observed in the mediastinal and hilar lymph nodes (**A**–**C**, arrows), or in the inflammatory lesion from the right side of the tongue to the right submandibular region (**D** and **E**, arrowheads), suggesting its specificity as an L-type amino acid transporter 1 (LAT1).[1–4] LAT1 is a cancer-type amino acid transporter that shows minimal expression in inflammatory lesions.[1,5] ^{18}F-α-methyl tyrosine, another LAT1-specific PET probe, was also reported to show no significant uptake in sarcoidosis lesions.[6–8] ^{18}F-FBPA PET can be used for precise evaluation of oncology patients in which the differentiation between reactive uptake and metastatic uptake is inconclusive on ^{18}F-FDG PET.