Comparison of ^{68}Ga-FAPI and ^{18}F-FDG PET/CT in metastasis of thyroid papillary carcinoma

Hell J Nucl Med 2021; 24(1): 100-101 *Epub ahead of print: 20 April 2021* *Published online: 30 April 2021*

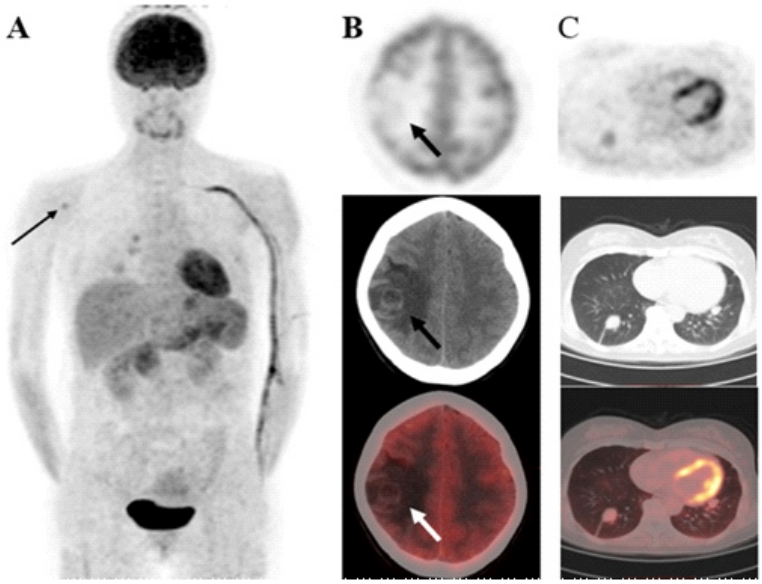

Figure 1. A 49-year-old woman with a history of radical resection of thyroid papillary carcinoma was admitted to hospital with headache a week ago. Laboratory tests showed that serum thyroglobulin (TG) (500ng/mL) was abnormally high. Iodine-131 (^{131}I) whole-body scan was negative. For further evaluation, the patient underwent both fluorine-18-fluorodeoxyglucose (^{18}F-FDG) and gallium-68 (^{68}Ga)-fibroblast activating protein inhibitor (FAPI) positron emission tomography/computed tomography (PET/CT) for the purpose of tumor staging. Maximum intensity projection (MIP) images of ^{18}F-FDG PET showed mild tracer uptake in multiple lesions of the right lung. The MIP (A, long arrow), axial CT, and fusion ^{18}F-FDG PET/CT images (not shown) showed bone destruction of the right shoulder joint increased ^{18}F-FDG uptake. Axial views of ^{18}F-FDG PET/CT (upper: PET image; middle: CT scan; lower: PET/CT fused image) showed no uptake of the right parietal lobe (B, solid arrow) which is a cystic low-density shadow with a large edema zone around it, and slight uptake of both lung lesions (C).

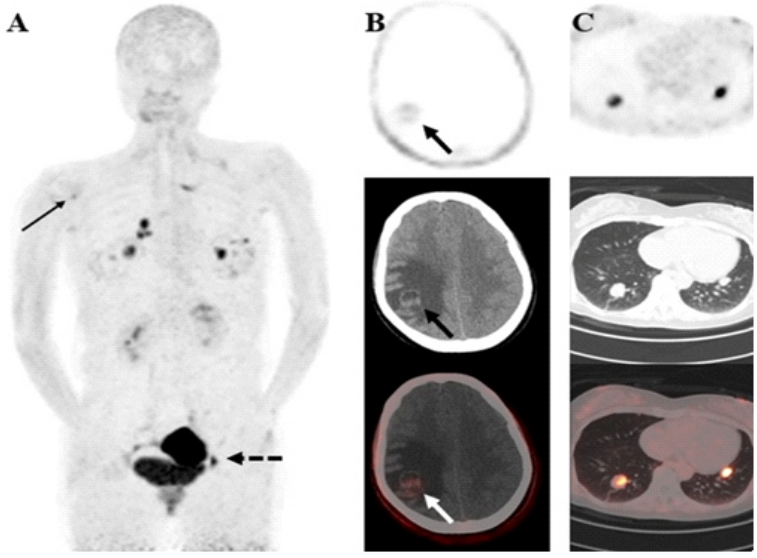

Figure 2. The maximal intensity projection image of ^{68}Ga-FAPI PET/CT showed multiple lesions in both lungs, intense uptake of lymph nodes in the left groin (dotted arrow) and moderate uptake of the right shoulder joint (A, long arrow). Gallium-68-FAPI PET/CT axial scan (top: PET image; middle: CT scan; bottom: PET/CT fusion image) showed slight uptake of the right parietal lobe (B, solid arrow) showed extremely high tumor-to-background contrast in the brain tumor. The intense uptake of multiple lesions in both lungs (C). Unexpectedly, in the lower abdomen, FAPI activity in the left inguinal lymph nodes was noted, which was negative on ^{18}F-FDG PET/CT. During our 3-month follow-up, the lesion in the brain was confirmed as metastasis by a cerebral magnetic resonance imaging (MRI). The patient subsequently underwent biopsy of the lung and left inguinal lymph node. Histopathologic results of the 2 lesions showed metastatic papillary carcinoma.

The newly developed PET tracer ^{68}Ga-FAPI specifically targets fibroblast activating protein that is over-expressed in cancer-related fibroblasts [1, 2]. Because fibroblast activating protein is under-expressed in most normal organs, it is an interesting target for PET imaging [3, 4]. Recent studies have shown that ^{68}Ga-FAPI is considered to be a promising PET tracer, which can be utilized in the diagnostic imaging of 28 kinds of tumors [5]. Other studies showed that ^{68}Ga-FAPI PET resulted in images with exceptionally clear tumor delineation and higher image contrast than ^{18}F-FDG PET [6-10]. In our case, ^{68}Ga-FAPI PET shows much better tumor-to-background contrast than ^{18}F-FDG PET, and reveals more metastatic lesions. In addition, compared with ^{18}F-FDG, the lower brain background of ^{68}Ga-FAPI may be a promising feature for evaluation of brain tumors and brain metastases.

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