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PET/MRI: A Promising Tool for Detecting Cardiac Neuroendocrine Tumor Metastasis

Tannoury J[1], Chalaye J[2], Deux JF[3], Luciani A[4], Itti E[5] and Sobhani I[6*]

[1]Department of Gastroenterology, APHP-Hospital Henri Mondor Creteil FR and EC2M3 Research Team Universite Paris-Est Creteil (UPEC)-Val de Marne Creteil, France

[2]Department of Nuclear Medicine, SyMPTOm PET/MRI platform, APHP-Hospital Henri Mondor Creteil, France

[3]SyMPTOm PET/MRI platform, Henri Mondor Hospital, AP-HP Creteil F-94010, FR University-Paris Est Creteil, INSERM IMRB U955 team 18 and GRC Amyloid Research Institute, Medical Imaging, APHP-Hospital Henri Mondor Creteil, France

[4]SyMPTOm PET/MRI platform, Henri Mondor Hospital, AP-HP Creteil F-94010, FR University-Paris Est Creteil, INSERM IMRB U955 Team 18 and GRC Amyloid Research Institute Creteil F-94000, France

[5]SyMPTOmPET/MRI platform, Henri Mondor Hospital, AP-HP Creteil, FR University-Paris Est Creteil, INSERM IMRB U955 Team 18 and GRC Amyloid Research Institute Creteil F-94000, France

[6]Department of Gastroenterology, APHP-Hospital Henri Mondor Creteil, FR EC2M3 Research Team, University Paris-Est Creteil (UPEC) -Valde Marne Creteil, France

[*]Corresponding author:

Iradj Sobhani,
Department of Gastroenterology & GI Oncology, Henri Mondor Hospital 51 Av Mal de Lattre de Tassigny 94010 CRETEIL, France,
E-mail: iradj.sobhani@aphp.fr

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1. Abstract

Neuroendocrine Tumors (NET) staging, including metastasis detection, will affect the management and the prognosis of the disease. MRI imaging and somatostatin receptor [SSTR]-targeted PET appear complementary for metastasis detection with a higher sensitivity of PET for lymph node and lung metastases identification and a higher sensitivity of MRI for liver metastases detection. Regarding metastases to the myocardium, they are often missing with daily practice standard imaging. PET/CT has been described to be useful in assessing myocardial metastases. We present a 39-year-old male with a well-differentiated, small bowel NET resected, considered in complete remission and myocardial metastasis demonstrated on PET/MRI.

2. Case Report

A 39-year-old male with a well-differentiated, grade 2, Ki-67 3-20%, small bowel Neuroendocrine Tumor (NET) resected in 2015 presented for follow-up two years later. He had no carcinoid syndrome, pain, or palpable mass and had not lost weight (85 kg). Bloodpressure was 110/80 mm Hg and heart rate 75/min. Five months earlier, the last thoracic-abdominal and pelvic contrast-enhanced computed-tomography scan including arterial and venous portal phase acquisitions showed no signs of relapse. He was receiving no treatment and was considered in complete clinical and biological remission since the surgical treatment.

Follow-up whole-body PET/MRI imaging was performed (Figure 1).

- Question: What is the diagnosis?
- Answer: Myocardial metastasis of neuroendocrine tumor.

(Figure 1A) shows not only normal ^{18}F-FDOPA uptake (basal ganglia, liver, pancreas, bile ducts, and urinary tract) but an abnormal focus in the chest (arrow) indicating an NET metastasis. The axial images through the heart demonstrate high ^{18}F-FDOPA uptake (1B) by an 8-mm right anterior myocardial nodule on the ECG-gated Steady State Fast Processing sequence (1C), with an exact match on the fused image (1D).

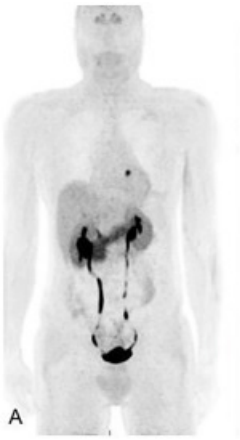

Figure 1A: Whole-body ^{18}F-FDOPA Maximum Intensity Projection acquired on a Biograph mMR PET/MRI platform (Siemens, Erlangen, Germany).

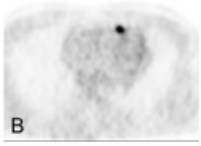

Figure 1B: Attenuation-corrected axial ^{18}F-FDOPA PET image of the chest

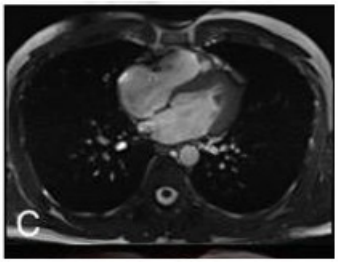

Figure 1C: Axial MRI T2 True FISP weighted image of the chest.

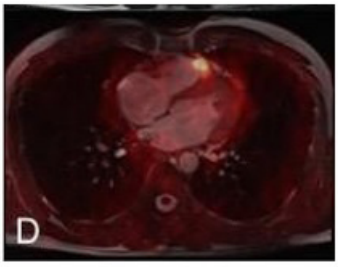

Figure 1D: Fused axial ^{18}F-FDOPA PET/ T2 MRI image of the chest

3. Discussion

Cardiac metastases have been reported in less than 1%-4.3% of patients with ileal NETs. There is no association with Cardiac neoplastic location and heart disease [1, 2]. PET/CT was useful in assessing these metastases in several studies [1,3, 5]. MRI and somatostatin receptor [SSTR]- targeted PET appear complementary for metastasis detection, with higher sensitivity of PET for lymph node and lung metastases and of MRI for liver metastases [4, 6]. Hence, during MRI screening of patients with NET for liver metastases, adding PET may improve the sensitivity of extra-hepatic metastasis detection [6, 7].

To our knowledge, cardiac metastasis detection by PET/MRI has not been reported previously. The cardiac metastasis in our patient was found at a time when the standard evaluation indicated NET remission during post-surgical follow up period for which PET/MRI is under evaluation [8]. Thus, performing PET/MRI during follow-up for NET can modify the therapeutic management in a way likely to improve patient outcomes.

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