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## Combined PET/CT by 18F-FDOPA, 18F-FDA, 18F-FDG and MRI correlation on a patient with Carney Triad

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### Abstract

Carney Triad is a rare syndrome involving gastrointestinal stromal tumor, pulmonary chondroma, and extra-adrenal paraganglioma. We present a 21 year old woman with the complete triad who was evaluated with MRI, 18F-FDOPA, 18F-FDA and 18F-FDG. 18F-FDOPA best demonstrated the paraganglioma, whereas hepatic metastases noted by MRI, demonstrated increased uptake only by 18F-FDG.

### Keywords

Carney Triad; 18F-FDOPA PET/CT; 18F-FDA PET/CT; 18F-FDG PET/CT; Magnetic Resonance Imaging

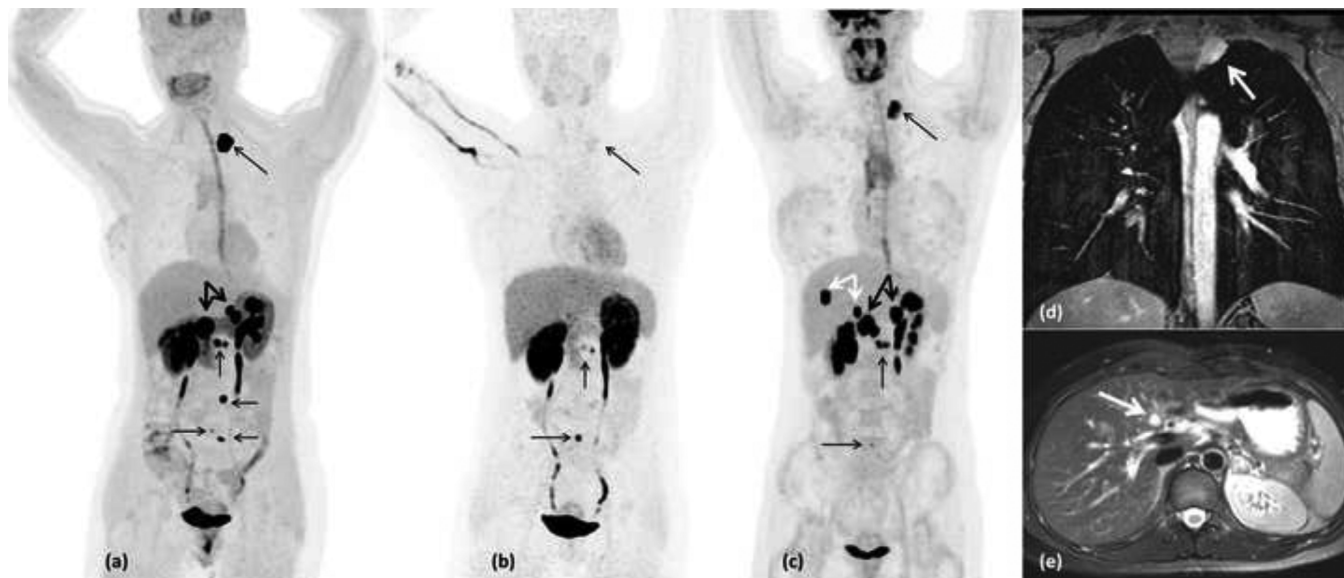
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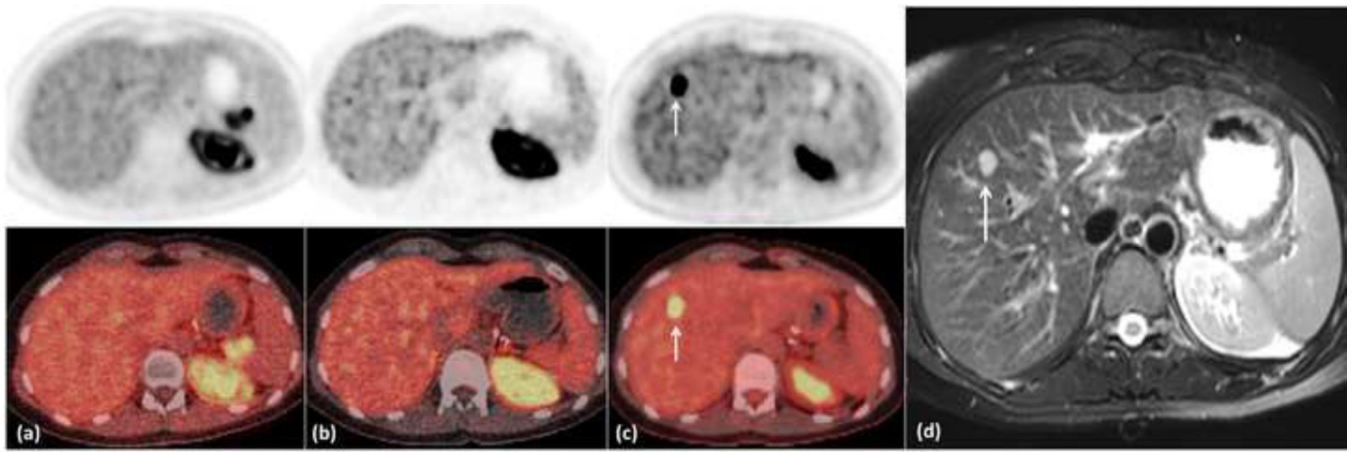
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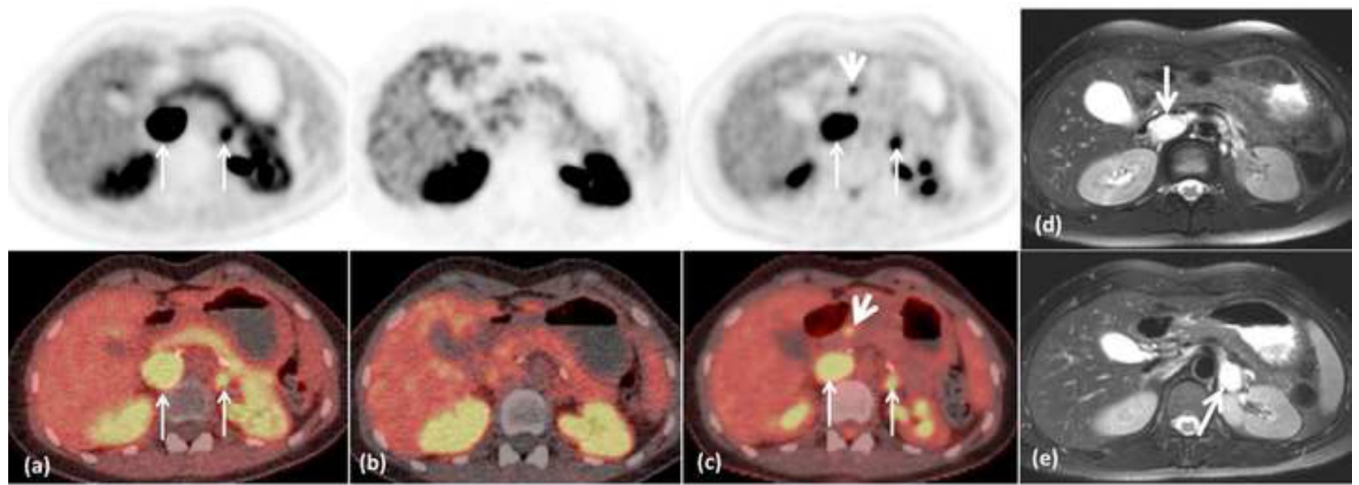
**FIGURE 1.**

Carney Triad is the association of gastrointestinal stromal tumor (GIST), extra-adrenal paraganglioma and pulmonary chondroma [1-4]. Very limited data regarding the application of molecular imaging in Carney Triad patients is available [5-12]. A 21-year-old female was diagnosed with gastric GIST, abdominal and carotid body paragangliomas, and one pulmonary chondroma, at the age of 11 establishing the diagnosis of Carney Triad. The patient underwent multiple surgeries for GIST and paragangliomas. She developed gastric GIST recurrence and multiple retroperitoneal and paraspinal paragangliomas. At the age of 15, she was admitted at the National Institutes of Health for further evaluation and treatment. She did not have germline or somatic mutations of c-kit (KIT), platelet-derived growth factor receptor A (PDGFRA), or succinate dehydrogenase subunits (SDHx) genes [13]. Laboratory studies demonstrated increased levels of urinary norepinephrine and normetanephrine, and plasma norepinephrine, dopamine, normetanephrine, and chromogranin A. She underwent PET/CT with 18F-FDOPA (L-DOPA analog) [14, 15], 18F-FDA (dopamine analog) [16, 17], and 18F-FDG (glucose analog) [18, 19] (Maximum intensity projection PET images -Figures 1a, b, c). The left paraspinal mass at the level of T1 and T2 vertebra demonstrated on gadolinium-enhanced T1-weighted coronal image of the chest (Figure 1d), showed intense uptake of 18F-FDOPA and 18F-FDG (Figures 1a, c), and mild uptake of 18F-FDA (Figure 1b). Two small liver masses seen on T2-weighted axial MRI images (Figures 1e, 2d), showed increased 18F-FDG uptake (Figures 1c-white double arrow), [Figure 3c- short white arrow (left liver lesion)] but no 18F-FDOPA or 18F-FDA uptake (Figures 1a,b). Two large masses in the upper abdomen showed vivid uptake of 18F-FDOPA and 18F-FDG (Figures 1a, c, black double arrow) but no 18F-FDA (Figure 1b). Additional small lesions were demonstrated in the abdomen and pelvis by molecular imaging but none by MRI. Five such lesions were best demonstrated by 18F-FDOPA (Figure 1a), whereas 18F-FDA and 18F-FDG depicted three of them, two at the level of L2, and one at L5 vertebra (Figures 1b,c). Thus, in this patient, 18F-FDOPA demonstrated the most paragangliomas, whereas 18F-FDG identified the most metastatic lesions.



**FIGURE 2.**

18F-FDOPA PET (Figure 2a) and 18F-FDA PET (Figure 2b) fused PET/CT axial images demonstrate no uptake while 18F-FDG show intense uptake (Figure 2c) in the right lobe of the liver lesion identified on axial T2-weighted MRI image (Figure 2d).



**FIGURE 3.**

Both  $^{18}\text{F}$ -FDOPA PET, fused PET/CT and  $^{18}\text{F}$ -FDG PET, fused PET/CT axial images (Figures 3a, c) vividly demonstrate the left and right upper retroperitoneal masses noted on T2-weighted axial MRI images (Figures 3d, e), whereas  $^{18}\text{F}$ -FDA show no uptake (Figure 3b).