

## Points

- In PET/CT, it is possible that sometimes only one of the modalities (PET or CT scan) may show pathology, while the other is negative.
- To obtain the maximum benefits from this technology, it is necessary that each study be evaluated in detail by nuclear medicine physicians and radiologists.
- The combined power of PET/CT is more than the power of either just PET or CT scan, individually.

## PET/CT A Power Greater than 1+1 = 2

There is a lot of confusion about what PET/CT actually is. Is it a nuclear medicine technique? Is it a radiology technique? In fact, in one hospital, the nuclear medicine people call it PET/CT and the radiologists call it CT-PET.

PET/CT is an amazingly powerful tool that combines the power of both PET and CT scan into a single technique. PET gives us functional and metabolic information due to the accumulation of FDG in cells with increased glucose metabolism. CT scan performed with oral and intravenous contrast, gives us anatomic and functional information. Another way of looking at PET/CT is that it is a powerful CT scan technique where we have multiple contrast agents; oral contrast, intravenous contrast and FDG.

But as these examples show, a PET/CT examination needs to be evaluated in detail, both by nuclear medicine physicians as well as by radiologists. Case 1 shows a patient with liver metastases and pancreatic

carcinoma, where the primary pancreatic malignancy was seen only on the contrast-enhanced CT scan and not on the PET study. Case 2 shows a patient with brain metastases, where the lesions were seen only on the PET study and not on the CT scan. Case 3 shows a patient where both CT scan and PET made a tremendous difference in understanding the pathology and diagnosing the presence of recurrence.

### Case 1 (Figs 1, 2): PET negative, CT scan positive.

This 74-year old woman presented with multiple hypoechoic lesions in the liver on USG. These were thought to be metastatic. PET/CT showed a large mass in the right lobe of the liver with other smaller lesions, along with active lymph nodes and lung nodules. No other mass was seen on the PET study.

The contrast-enhanced CT scan however showed an ill-defined hypodense mass in the uncinate process of the pancreas. A CT-guided biopsy showed adenocarcinoma.

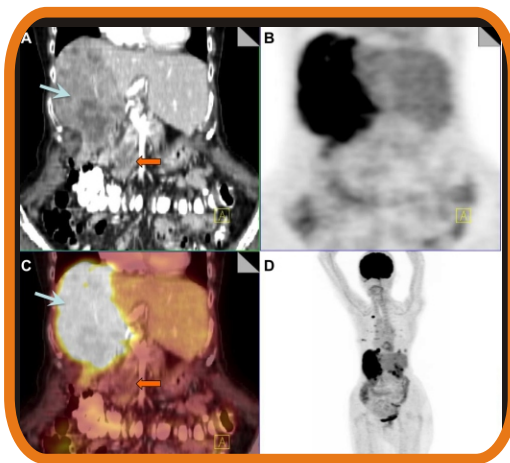


Fig. 1

Fig. 1: Case 1. Coronal images show a large, metastatic, FDG-avid liver mass (blue arrow). The uncinate process mass (red arrow) is seen on the CT scan (A, C), but does not show FDG uptake on the PET study (B, C, D).

#### Legends:

All figures follow the following protocol. Upper left (A) CT scan, upper right (B) PET image, lower left (C) fused PET/CT image, lower right (D) MIP coronal PET image

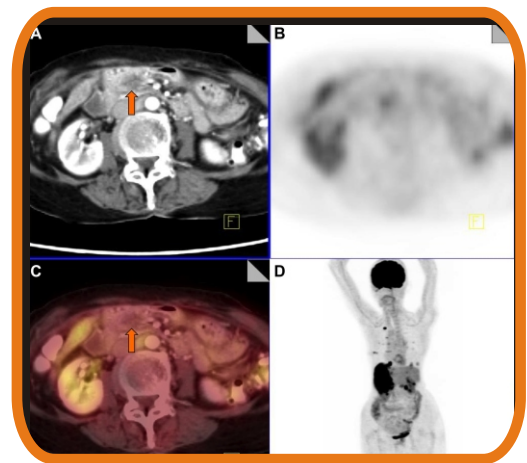


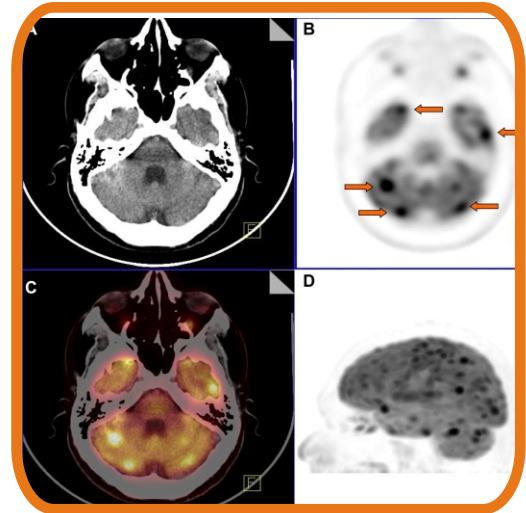
Fig. 2

Fig. 2: Case 1. Axial images show the pancreatic head mass without FDG uptake (red arrow) very well.

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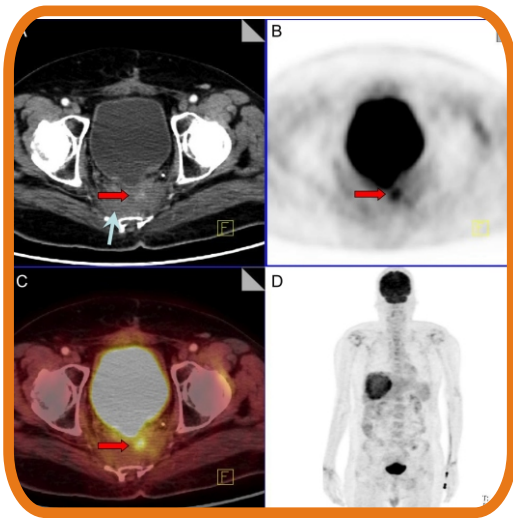
**Case 2 (Fig. 3): PET positive, CT scan negative.**

This 47-year old man had a lung mass. On the PET/CT study, the PET study showed extensive brain parenchymal metastases (SUVmax: 16.5) with an additional metastatic lesion in the scalp. Contrast-enhanced CT scan of the brain was unable to depict any of these lesions in the brain, even retrospectively.



**Fig. 3**

Fig. 3: Case 2. Axial images of the brain show multiple, active lesions in the brain on the PET study (B, C, D), but not a single lesion could be identified on the contrast-enhanced CT of the brain (A).



**Fig. 4**

Fig. 4: Case 3. Axial images show the large presacral, post-APR, fibrous mass, without FDG uptake (blue arrow in A). The PET study (B, C) shows a focus of increased uptake on the left (red arrow), which was also enhancing on the contrast-enhanced study (red arrow in A) and was proven to be recurrence on biopsy.

**Case 3 (Fig. 4): PET and CT scan synergistic**

This 62-year old man was operated for carcinoma of the rectum and an abdomino-perineal resection (APR) was performed. A year later, he came with rising tumor markers. A PET/CT showed the typical, triangular-shaped area of post-APR fibrosis, in the operative bed, on the contrast-enhanced CT scan study with a focus of abnormal enhancement on the left. The PET study also showed significant FDG uptake in the enhancing focus, without uptake in the rest of the fibrotic mass, suggesting a small focus of recurrence, which was then confirmed on biopsy.

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