

# PET Bytes

News from *The Positron Imaging Facility* at UT Southwestern Medical Center at Dallas

August 2004

## PET Imaging in Dementia

In June 2004, CMS determined that Medicare would pay for brain PET scans for diagnosis of dementia, including Alzheimer Disease (AD) and frontotemporal dementia (FTD). An effective date has not yet been given, but likely will be in the next six months. There are several criteria that must be met to qualify for Medicare payment for this indication. These include cognitive impairment for at least six months, an evaluation which as not determined a clear etiology for the impairment, and that no Single Photon Emission Tomogram (SPECT) has been performed for the same purpose.

This approval results from research that shows the clear benefit of FDG PET scans in diagnosing dementia, many times much in advance of anatomic changes seen on MRI and prior to a definite diagnosis based upon clinical examination. FDG PET shows areas of the brain which have reduced glucose metabolism and certain patterns are characteristic for the different dementias. For example, AD typically has reductions in glucose metabolism in the posterior cingulate cortex, parietal and temporal cortices (Figure 1). FTD shows reductions in the frontal and temporal cortices, although there are some

subvariations of this latter pattern, for example in Lewy Body dementia.

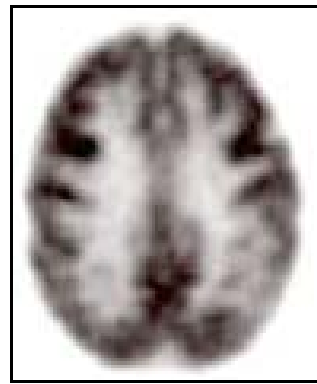


Figure 1.

**Transaxial PET image shows hypometabolism of the parietal cortices, consistent with a diagnosis of AD.**

## PET Imaging in Epilepsy

Presurgical evaluation of epilepsy is the only other Medicare approved indication for FDG PET brain imaging at this time. In this case, reductions in metabolisms are seen in the area of the brain from which seizures begin, often times involving the temporal lobes. (Figure 2). Patients who have a clear seizure focus, based upon FDG PET and other diagnostic examinations, may benefit from surgical removal of that part of the brain.

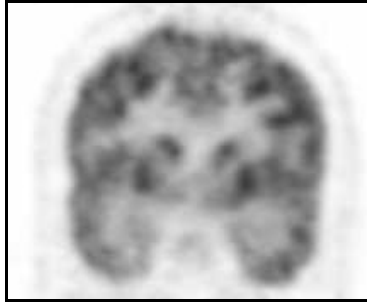
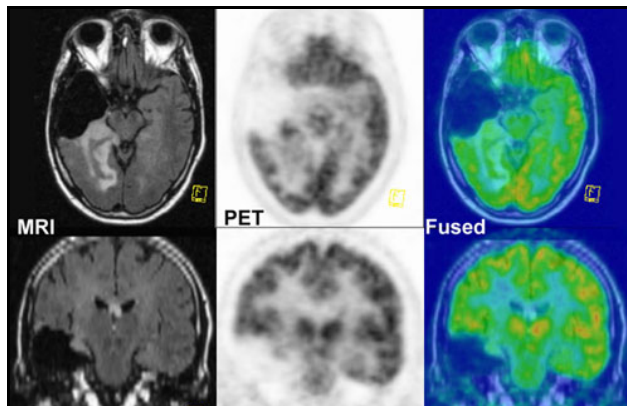


Figure 2

**Hypometabolism in the medial right temporal lobe on interictal PET scan.**

### PET Imaging of Brain Tumors

PET is useful in surveillance of patients with primary brain tumors. In patients who have undergone resection and radiation of these tumors, it is sometimes difficult with MRI imaging alone to determine if there is presence of tumor recurrence versus radiation necrosis. Using FDG PET, recurrent tumor will be seen as an area of FDG accumulation whereas radiation necrosis should show little or no FDG uptake.



**Figure 3.** Left panels shows axial and coronal MRI of patient who has undergone resection of a right temporal glioma. The high signal could represent either necrosis or recurrence. The center panel FDG PET scans show a small focus of FDG accumulation in the medial portion of the resection consistent with recurrence. The right panel contains fused images combining the PET and MRI.

Low-grade tumors, however, often show little FDG accumulation, consistent with a low metabolic rate. Radiopharmaceuticals that demonstrate amino acid transport, such as  $C^{11}$  methionine or  $F^{18}$  DOPA, or DNA proliferation, such as  $F^{18}$  thymidine (FLT), may be more useful in these tumors. Because of the short half-life,  $C^{11}$  is presently limited to sites with a cyclotron. The two tracers labeled with  $F^{18}$  are presently under investigation for use in brain tumors.

### References:

1. Silverman DHS and Phelps ME. Evaluating dementia using PET: how do we put into clinical perspective what we know to date? *JNM* (2000) 41: 1929-1932.
2. Becherer A, et al. Brain tumour imaging with PET: a comparison between [ $^{18}F$ ] fluorodopa and [ $^{11}C$ ] methionine. *Eur J Nucl Med Mol Imaging* (2003) 30: 1561-1567.

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