

Positron Emission Tomography (PET)

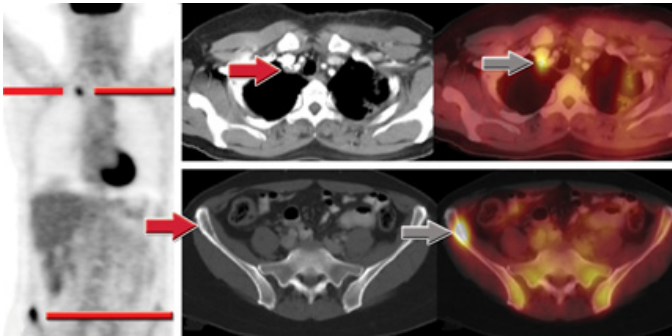
A PET scan allows physicians to measure the body's abnormal molecular cell activity to detect

- **Cancer** (such as breast cancer, lung cancer, colorectal cancer, lymphoma, melanoma and other skin cancers,
- **Brain Disorders** (such as Alzheimer's Disease, Parkinson's Disease, and epilepsy), and
- **Heart Disease** (such as coronary artery disease).



PET scans are simple, painless, and quick, offering patients and their families life-saving information that helps physicians detect and diagnose diseases early and quickly begin treatment.

PET scanning and molecular imaging provide real life answers to better diagnose illness, guide treatment options, and give patients ultimate control over their critical, life-saving health care decisions.



Case Study: Breast Cancer

History: 50 year old female, with history of breast cancer status post lumpectomy, chemotherapy. Patient presents with recurrence with positive biopsy of a supraclavical lymph node, but no other disease noted on CT alone.

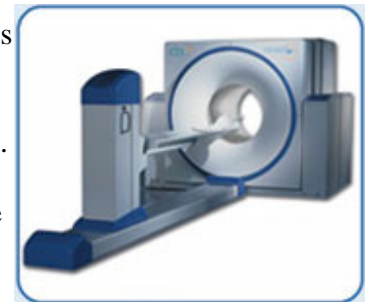
PET/CT Findings: Focal lesion posterior to the brachiocephalic vein consistent with metastatic

disease. Intense area of focal uptake in the left iliac crest without an identifiable CT correlate. Findings are still consistent with metastatic disease.

Discussion: This case is a good example of the added benefits of PET/CT. First, the patient had a subtle abnormality detected posterior to the brachiocephalic vein that is barely visible on CT, but is certainly very compelling on the fused PET/CT image. Secondly, the patient has a large lesion in the right iliac crest that is not visible on the CT portion of the exam. It is not uncommon to find a lesion on PET, localize it to bone using PET/CT, but realize there is no bony destruction yet.

Change in treatment plan: Treatment was ultimately changed from local radiation to the supraclavical area to systemic chemotherapy.

What is PET? PET is a medical imaging tool, which assists physicians in detecting disease. Simply stated, PET scans produce digital pictures that can, in many cases, identify many forms of cancer, damaged heart tissue, and brain disorders such as Alzheimer's, Parkinson's, and epilepsy. Technically, PET is a medical imaging technology that images the biology of disorders at the molecular level before anatomical changes are visible.

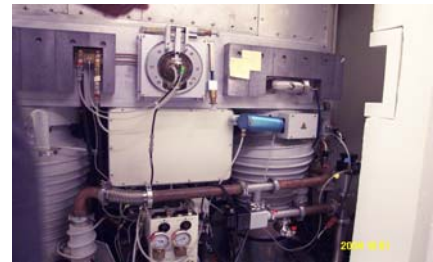


A PET scan is very different than an ultrasound, X-ray, MRI, or CT,

which detect changes in the body structure or anatomy as a lesion (for example, a sizeable tumor) or musco-skeletal injury. A PET scan can distinguish between benign and malignant disorders (or between alive and dead tissue), unlike other imaging technologies which merely confirm the presence of a mass. A PET scan can detect abnormalities in cellular activity, generally before there is any anatomical change. A PET scan can, in many cases, identify diseases earlier and more specifically than ultrasound, X-rays, CT, or MRI.

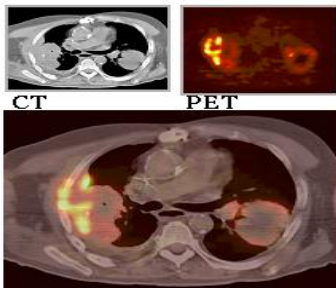
How PET Works? When disease strikes, the biochemistry of your tissues and cells change. In cancer, for example, cells begin to grow at a much faster rate. A PET scan takes a digital picture of abnormal cellular structure.

The most common form of a PET scan begins with an injection of a glucose-based radiopharmaceutical (FDG), which travels through the body, eventually collecting in the organs and tissues targeted for examination. A cyclotron is required to produce PET tracers, which have short half-life time.



The patient lies flat on a bed/table that moves incrementally through the PET scanner. The scanner has cameras that detect the gamma rays emitted from the patient, and turns those into electrical signals, which are processed by a computer to generate the medical images. The bed/table moves a few inches again, and the process is repeated.

This produces the digital images, which are assembled by the computer into a 3-D image of the patient's body. If an area is cancerous, the signals will be stronger there than in surrounding tissue, since more of the radiopharmaceutical (FDG) is being absorbed in those areas.



Why PET Works? PET scans give information about the body's chemistry that is not available with other imaging techniques. PET scans reveal metabolic information (as opposed to anatomical information), providing your physician with extra insight. Because PET scanning often reveals disease much earlier than conventional diagnostic procedures (such as CT or MRI), it can help physicians diagnose disease faster.

What PET Sees? PET is a procedure that is able to detect small cancerous tumors, and also subtle changes in the brain and heart. This enables physicians to treat these diseases earlier and more accurately than if they waited for the results from other detection modalities.

PET history: PET began in the 70's as a research tool. The technology advanced from digital coincidence to 3-D images in the 80's. Then in the late 90's a new detector material was invented called LSO (Lutetium Oxyorthosilicate). In 2000, PET/CT scanner was born. This hybrid marries two technologies, simultaneously showing both anatomical structure and cellular function. Thus, the PET/CT provides the physician and the patient with the most complete and accurate image, as well as the highest quality diagnostics within a single scan.

A PET scan puts time on your side! The earlier the diagnosis, the better the chance for successful treatment.

