

# **Positron Emission Tomography (PET)**

## **Introduction**

PET is a nuclear medicine medical imaging technique that produces a 3-D image of functional processes in the body. A PET scan uses a small amount of a radioactive drug, or tracer, to show differences between healthy tissue and diseased tissue. The most commonly used tracer is called FDG (fluorodeoxyglucose), so the test is sometimes called an FDG-PET scan. Before the PET scan, a small amount of FDG is injected into the patient. Because cancer grows at a faster rate than healthy tissue, cancer cells absorb more of the FDG. The PET scanner detects the radiation given off by the FDG and produces color-coded images of the body that show both normal and cancerous tissue.

Currently, many PET scanners also include a conventional computed tomography (CT) scanner. This allows images of both anatomy (CT) and function (PET) to be taken during the same examination.

## What is Positron Emission Tomography (PET)?

Positron Emission Tomography (PET) is a non-invasive diagnostic scanning technique that provides visual images of organ function (including blood flow, oxygen consumption, glucose metabolism, and concentrations of molecules in the brain and body tissues). During the scanning process, small amounts of radioactive compounds are injected into the body where they are absorbed by organs and tissues. The PET scanner picks up signals from the radioactive tracers and detects biochemical changes in metabolic processes that aid in disease diagnosis. Other diagnostic techniques such as CT and MRI scans can only detect structural changes after tissue damage has occurred.

### *Facts about PET Scan*

Let's check out some important facts about PET scan that mentioned below:

- The way a disease developed in the human body is diagnosed using this technology.
- The doctor can check the way a certain part of the body works using this technology along with MRI or CT scan.
- The conditions like heart disease, epilepsy, cancer, and Alzheimer's disease can be investigated using PET Scan technology.
- It is strongly advised that the patients shouldn't get food at least 6 hours before performing this test. Also, they should drink lots of water.

### *What are risks involved with a PET Scan?*

There is a great involvement of radioactive tracers in this technology, but the exposure is quite low. Still, there are certain risks involved about which we have explained in detail below:

- There are many people who are allergic to the iodine, saccharin or aspartame should tell about it to their doctor.
- On the other hand, the pregnant ladies should not have a PET scan because radiation is considered unsafe for creating fetuses.
- There is a chance that one might feel discomfort if they aren't comfortable with the needles. It may result in many symptoms like swelling, bruising, and bleeding.

### *What are the benefits of a PET Scan?*

There are plenty of advantages offered by the PET Scan technology about which we have explained in detail below:

- There is only half an hour taken by the PET Scan to get completed. Furthermore, the complete process is painless and noninvasive.
- In addition to offering amazing imaging data, it assists in minimizing the sessions one has to undergo during a certain treatment.
- The PET Scan provides new details that can assist in altering the treatment of a patient.

***Is there any complication after the test?***

The patient can resume their daily operations after completing this test. However, it is better to follow the doctor's instructions. Still, it is strongly recommended that they should limit contact with pregnant women and infants as the radioactive material stays in the body for almost 12 hours.

Additionally, it is suggested that the patients should drink lots of fluids as they will assist in eliminating the tracers from the system. In normal cases, it takes up to 48 hours for eliminating tracers.

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## Uses of PET

### Disease Diagnosis

PET scans are utilized to diagnose heart disease, brain tumors, stroke, cancer, epilepsy, head injuries, Parkinson's disease, and many other disorders. By measuring blood flow to the heart, PET scans can be used to diagnose disorders such as coronary artery disease. PET scans can also help to determine the extent of muscle damage caused by a heart attack. One of the most significant advantages of PET is its ability to detect biochemical changes in body tissues before structural damage occurs from disease. This information allows clinicians to be proactive in their treatments.

### Treatment Monitoring

Clinicians use PET scans to measure the effectiveness of current disease treatments. Scans taken at various intervals during drug therapy can demonstrate whether the medication is working, or if the treatment should be modified. Post-treatment scans evaluate the effectiveness of the treatment and can also identify early signs of disease recurrence.

### Research

Research scientists use PET scans to study brain activity and chemical mechanisms involved in diseases such as schizophrenia, depression, Alzheimer's disease, alcohol dependence, and substance abuse. By studying tissue concentrations of the absorbed radiotracer, scientists can determine if the tracer is effectively reaching molecular targets. This information can aid scientists in the development of new medications and dosing regimens.

## The PET scanning Process

A radioactive tracer is produced in a cyclotron machine, attached to a naturally occurring body compound (such as glucose), and administered to the patient intravenously. The tracer is absorbed by the body and concentrates in tissues and organs.

The patient lies on a table that slides slowly through a PET scanner. As the patient slides through the circular opening of the scanner, the tracer emits radioactive signals. These signals are recorded by multiple rings of detectors in the scanner and are converted into three-dimensional computer images of tissue concentrations and organ function.

Levels of tissue concentrations and organ function are represented by different colors or degrees of brightness on computer-generated PET images. Some of the radioactive tracer will be seen in normal tissues because healthy tissues use glucose for energy. Cancerous tumors utilize more glucose than normal tissues and will appear much brighter.

Once the scanning session has been completed, a specially trained radiologist will interpret the scan, record their findings, and forward this information to the referring physician to discuss with their patient.

## Advantages

### The Pros of Pet Scans

1. Since it can study bodily functions through biochemical processes, the scans are able to detect diseases before the symptoms and signs show hence they are more effective compared to the other imaging tests.
2. Since it studies metabolic functions of a patient, PET imaging can be used as an alternative to biopsy and also other exploratory surgeries conducted to determine how far a disease has spread.
3. Its ability to differentiate between non-cancerous and cancerous tumors, PET scans are the most precise medical tools to help minimize the number of unnecessary surgeries done because of wrong staging data and diagnosis.
4. PET scans are effective for diagnosing early stages of certain neurological illnesses such as Alzheimer's disease, epilepsy and other mental illnesses.
5. PET scans are the best options for those people scared of getting infection from medical procedures.
6. As compared to other forms of CT scans, PET scans are a bit safer as the radiation dosage one is exposed to is relatively low.

## Disadvantages

1. Even though the radioactive elements used in these scans are short lived it might cause some complications especially to pregnant patients.
2. Even though the radioactive components used in the scans are not long lasting it is still exposure to radioactive rays which is not good and which also means there is only a number of times one can undergo PET imaging.
3. Since it is a new procedure, it is quite expensive compared to other forms of medical imaging. They also require a cyclotron which is an expensive machine used to create radioisotopes that are used to produce the radioactive rays required for imaging and thus is a very expensive treatment to come by.

## Reference

- [www.google.com](http://www.google.com)
- [www.wikipedia.com](http://www.wikipedia.com)
- [www.studymafia.org](http://www.studymafia.org)