PET scan , Gamma knife

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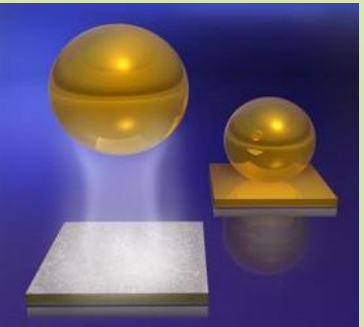
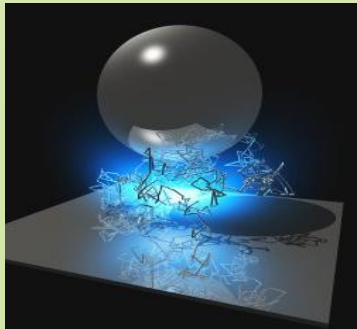


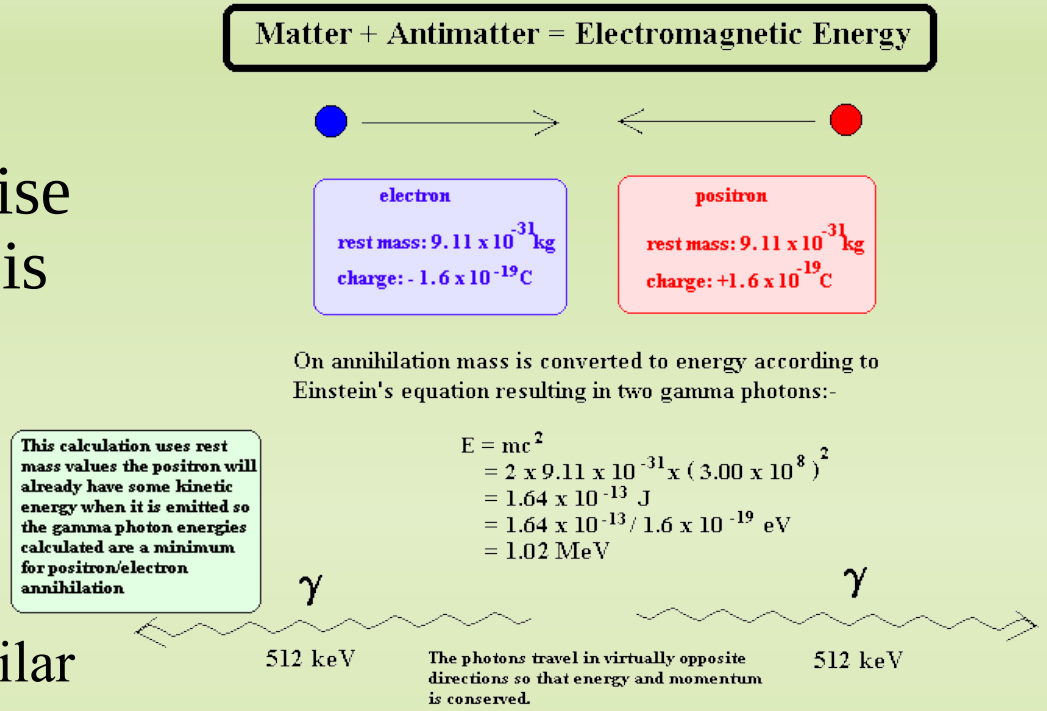


Outline

- INTORDUCTION
- PET SCAN
- Gamma Knife

Physics of Diagnostic and Therapy

- Gamma Knife radiosurgery, also called stereotactic radiosurgery, is a very precise form of therapeutic radiology. Even though it is called surgery
- It uses beams of highly-focused gamma rays to treat small to medium size lesions, usually in the brain.



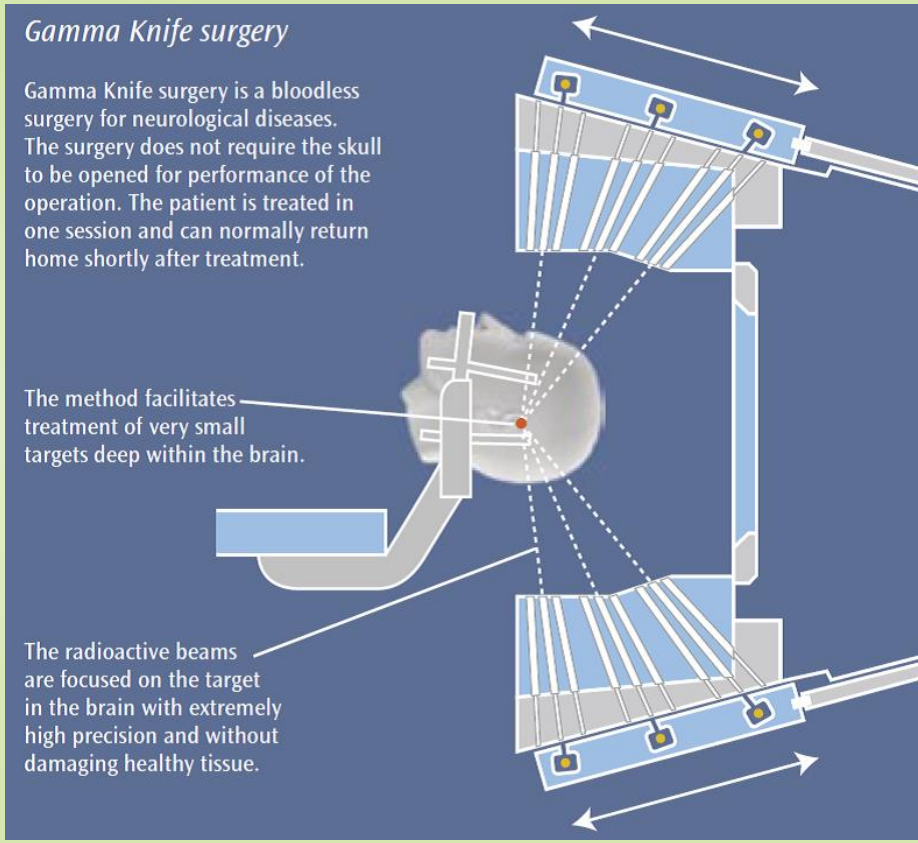
- Gamma Knife is called “surgery” because a result similar to an actual surgical procedure is created by a one-session radiation therapy treatment.
- it may also be used in persons whose condition is such that they might not be able to tolerate a surgical procedure, such as craniotomy,

How does Gamma Knife radiosurgery work?

- **works in the same manner as other types of therapeutic radiology:**
- does not involve actual surgery, nor is the Gamma Knife really a knife at all

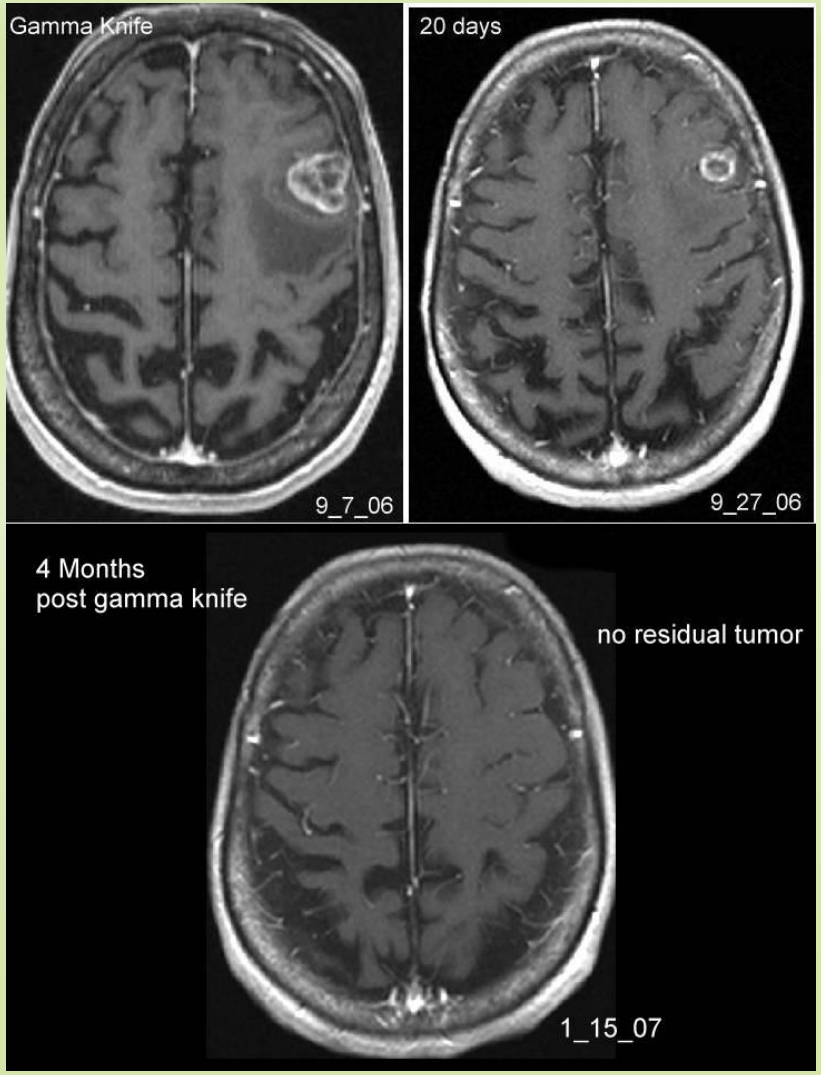
- It uses beams of highly-focused gamma rays to treat small to medium size lesions, usually in the brain. Many beams of gamma radiation join to focus on the lesion under treatment, providing a very intense dose of radiation without a surgical incision or opening.

- it distorts or destroys the DNA of tumor cells, causing them to be unable to reproduce and grow.



Type of radiation

- Gamma Knife radiosurgery may be used in situations where the brain lesion cannot be reached by conventional surgical techniques
- A Gamma Knife typically contains 201 cobalt-60 sources of approximately 30 curies (1.1 TBq), each placed in a hemispheric array in a heavily shielded assembly.
- Gamma Knife radiosurgery has proven effective for patients with benign or malignant brain tumors up to 4 centimeters in size, vascular malformations such as an arteriovenous malformation (AVM), pain, and other functional problems



Gamma Knife treatment generally involves these steps

- **head frame placement**

The head frame also is a guide to focus the gamma ray beams to the exact location of the lesion being treated.

- **radiation dose planning**

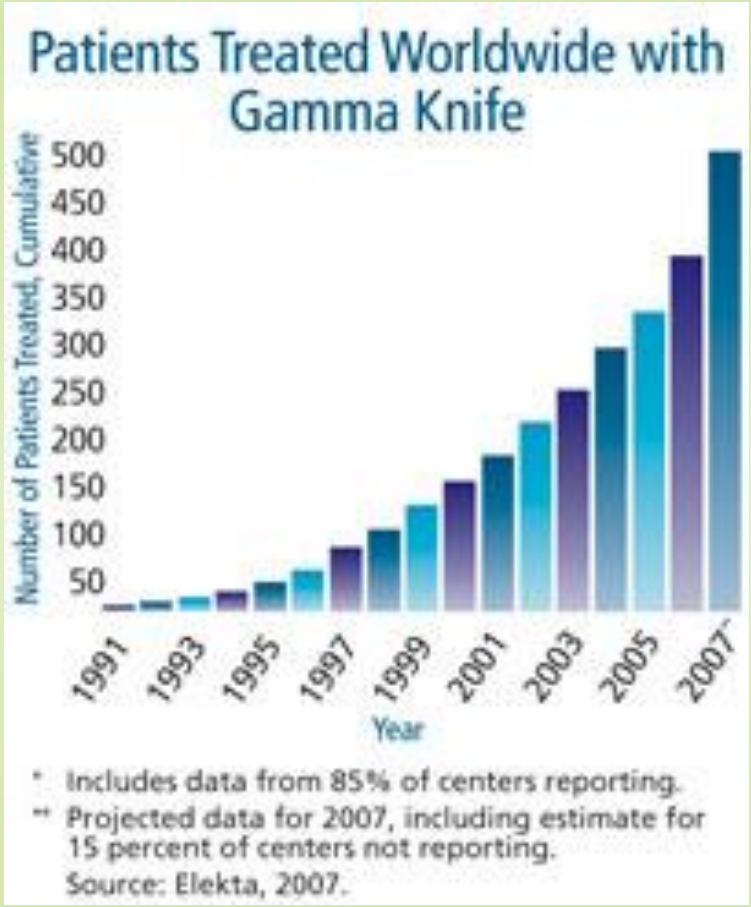
the radiation therapy team will determine the treatment plan. The results of the imaging scan, along with other information, will be used by a medical physicist to determine the best treatment.

Gamma Knife treatment generally involves these steps

- **radiation treatment**

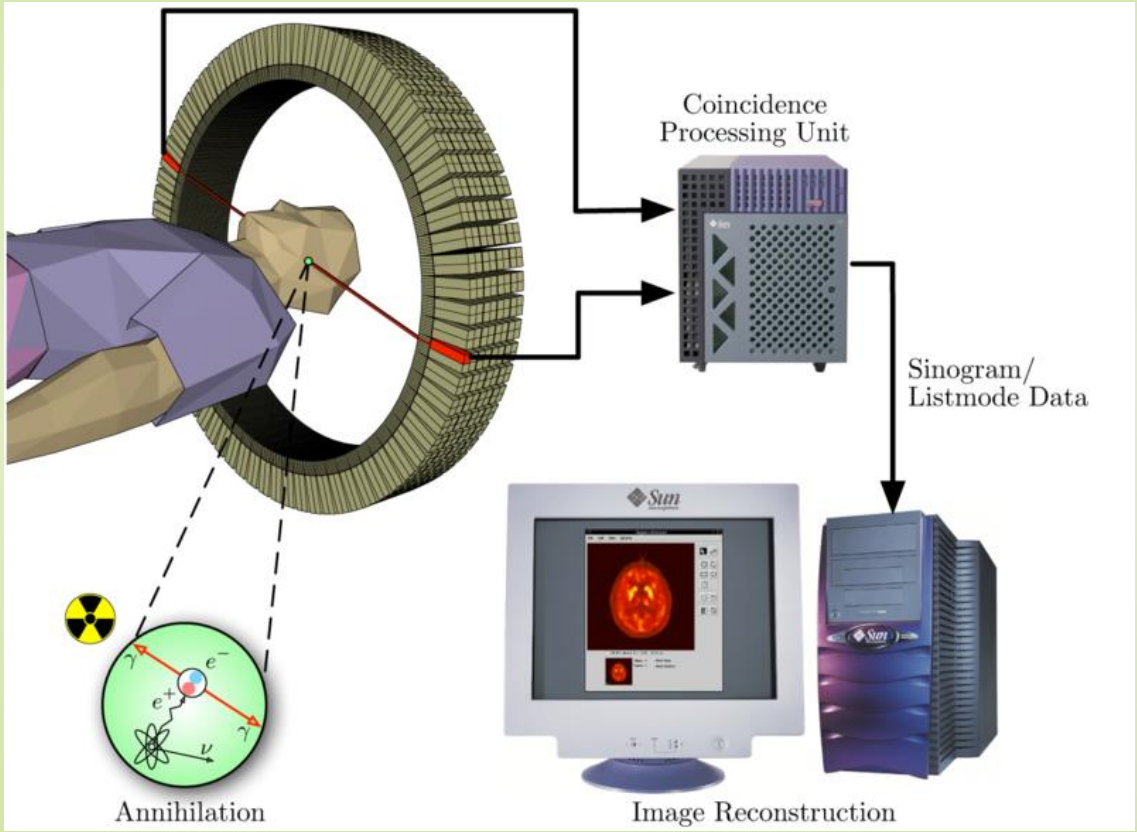
- many hundreds of holes in it is placed over the head frame. These holes help to focus the radiation beams on the target. Treatment will last a few minutes up to a few hours,

Gamma Knife radiosurgery is able to accurately focus many beams of gamma radiation on one or more tumors. Each individual beam is of relatively low intensity, so the radiation has little effect on intervening brain tissue and is concentrated only at the tumor itself.



PET SCAN

- Positron-emission-tomography (PET)
- is a nuclear medicine functional imaging technique that is used to observe metabolic processes in the body as an aid to the diagnosis of disease
- PET is both a medical and research tool. It is used heavily in clinical oncology (medical imaging of tumours and the search for metastases), and for clinical diagnosis of certain diffuse brain diseases such as those causing various types of dementias.
- PET is also an important research tool to map normal human brain and heart function, and support drug development.

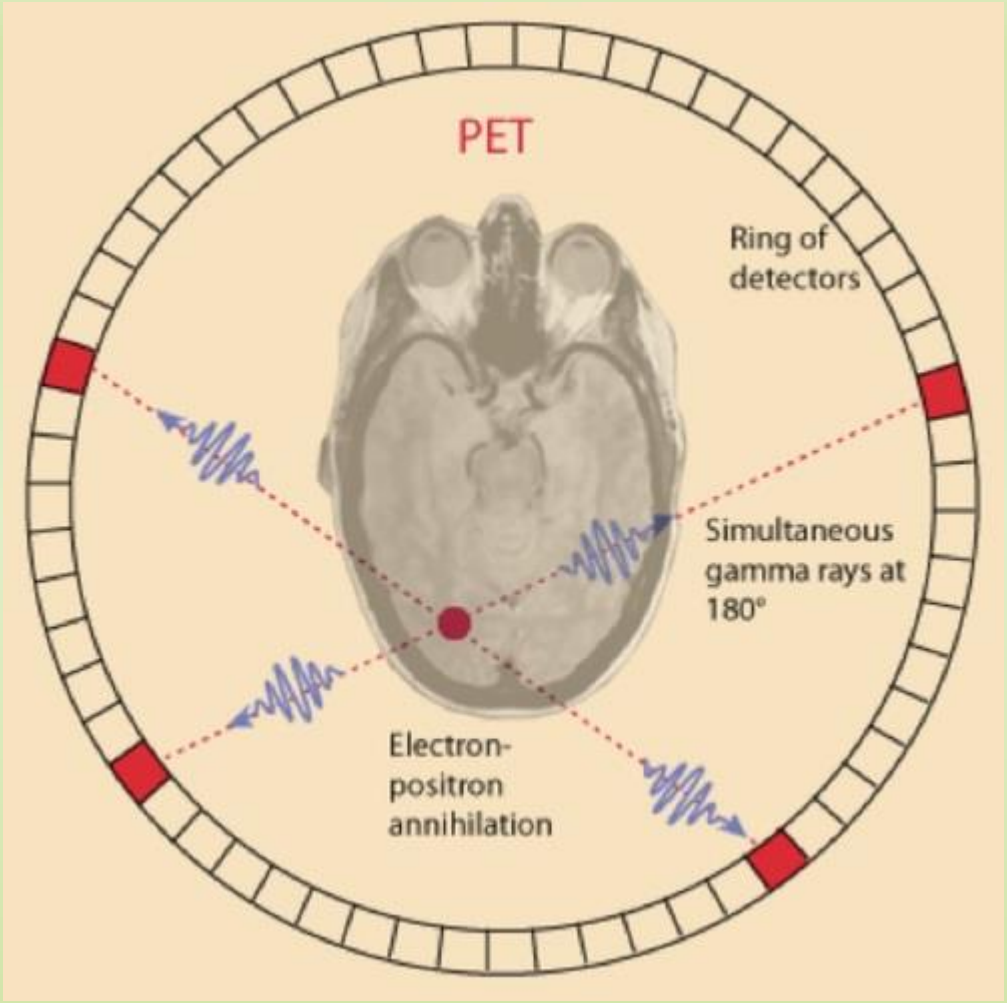


radioactive nuclei three categories

- The system detects pairs of _rays emitted indirectly by a positron-emitting radionuclide (tracer)
- A radiotracer consists of radioactive material that is tagged to a natural chemical, such as glucose.

This radiotracer is injected into the body, where it travels to cells that use glucose for energy

The more energy a group of cells needs, the more the radiotracer will build up in that location. This will show up on images that are reconstructed by a computer.

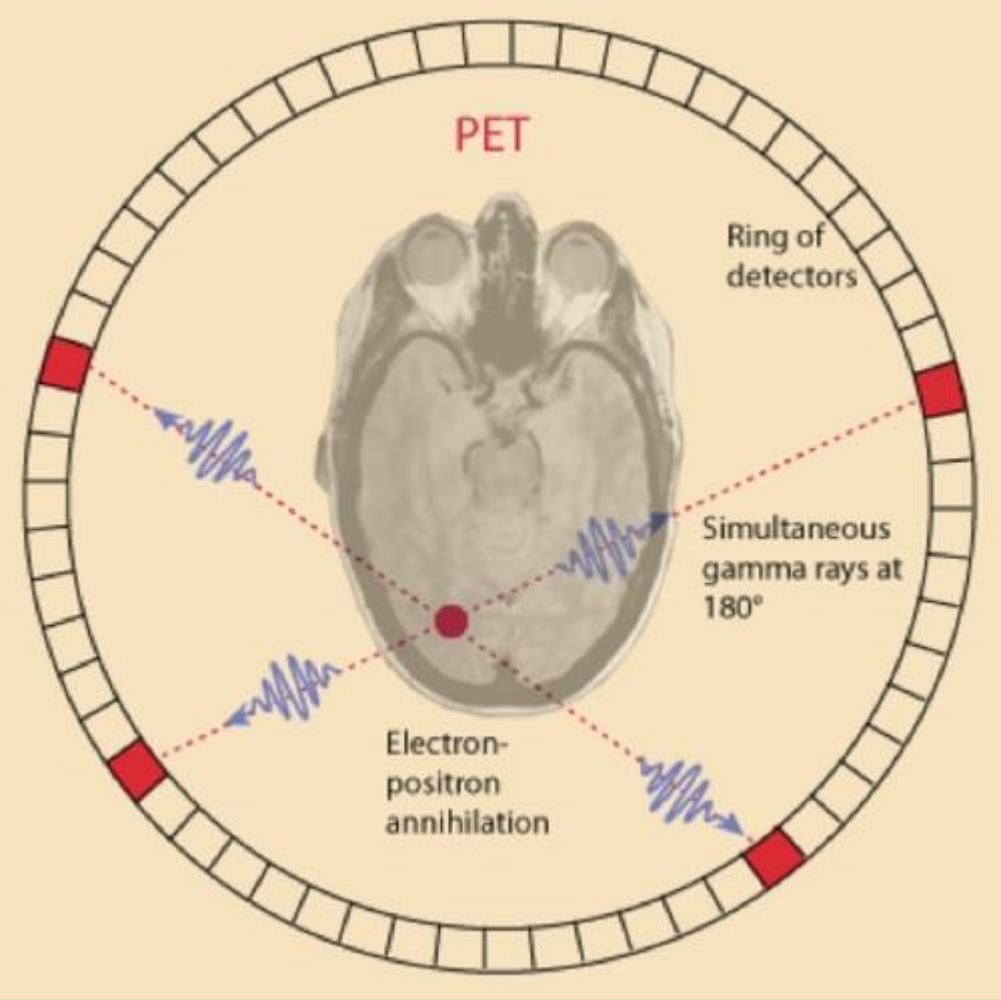


radioactive nuclei three categories

- Three-dimensional images of tracer concentration within the body are then constructed by computer analysis. In modern PET-CT scanners, three-dimensional imaging is often accomplished with the aid of a CT X-ray scan performed on the patient during the same session, in the same machine.

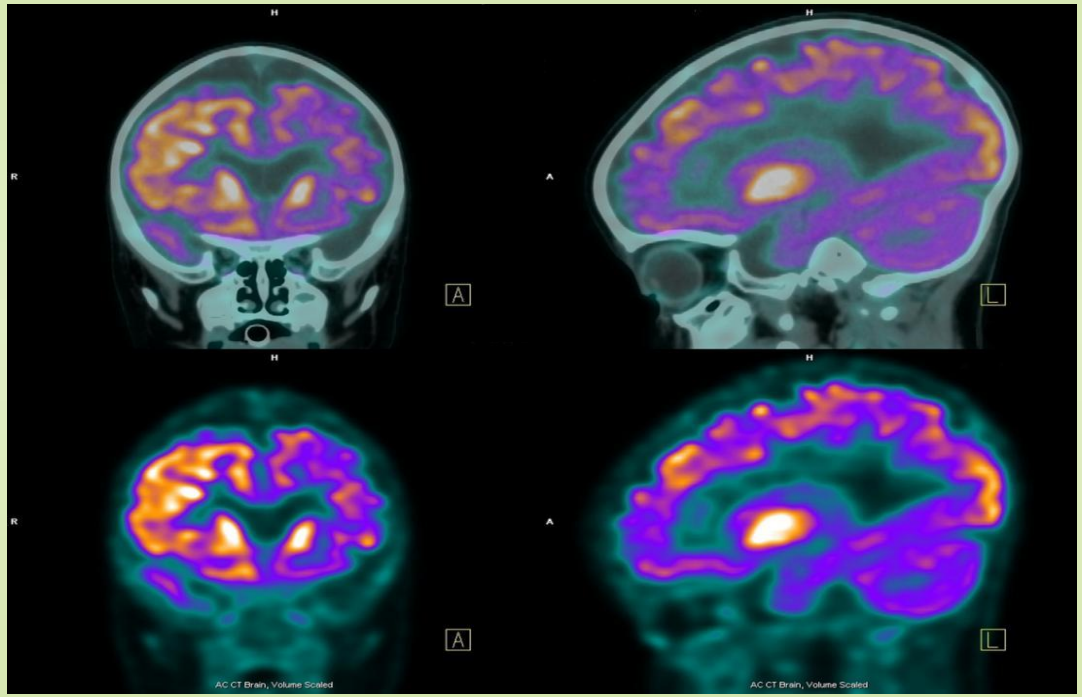
The cells, or activity, will show up as "hot spots" or "cold spots.“

- Active areas are bright on a PET scan. They are known as "hot spots.“ Where cells need less energy, the areas will be less bright. These are "cold spots.“ Compared with normal cells, cancer cells are very active in using glucose, so a radiotracer made with glucose will light up areas of cancer.



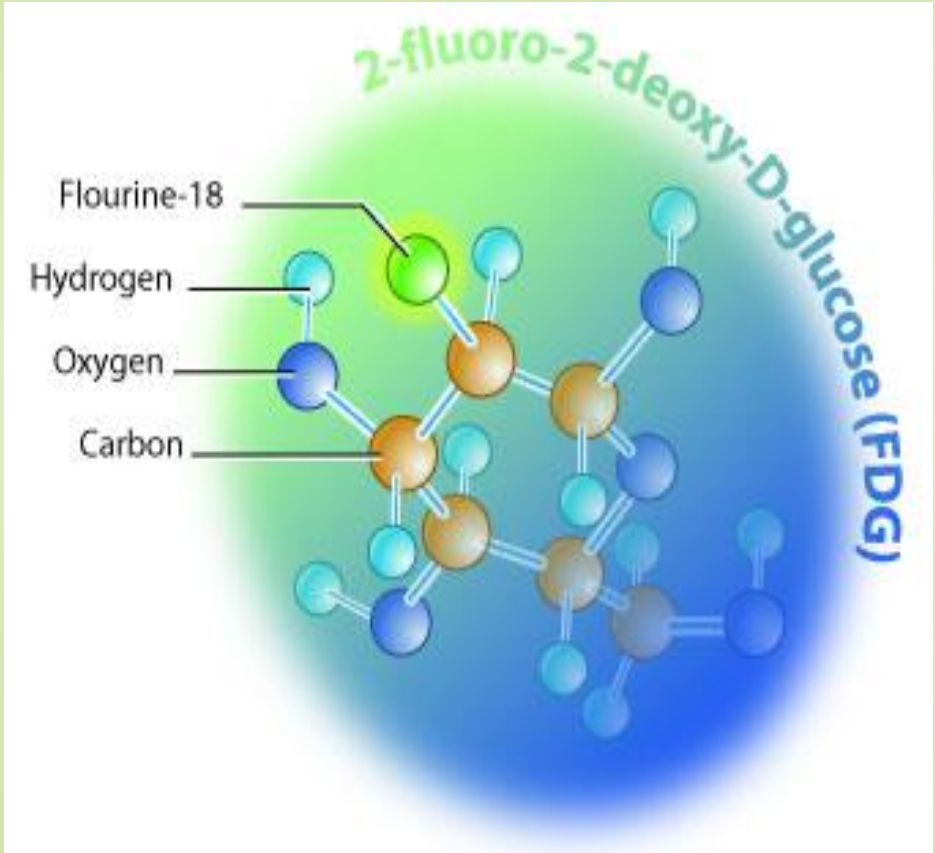
radioactive nuclei three categories

- An example of a glucose-based radiotracer is fluorodeoxyglucose (FDG). In FDG, radioactive fluoride molecules are tagged to glucose to make a radiotracer. FDG is the radiotracer most commonly used today.



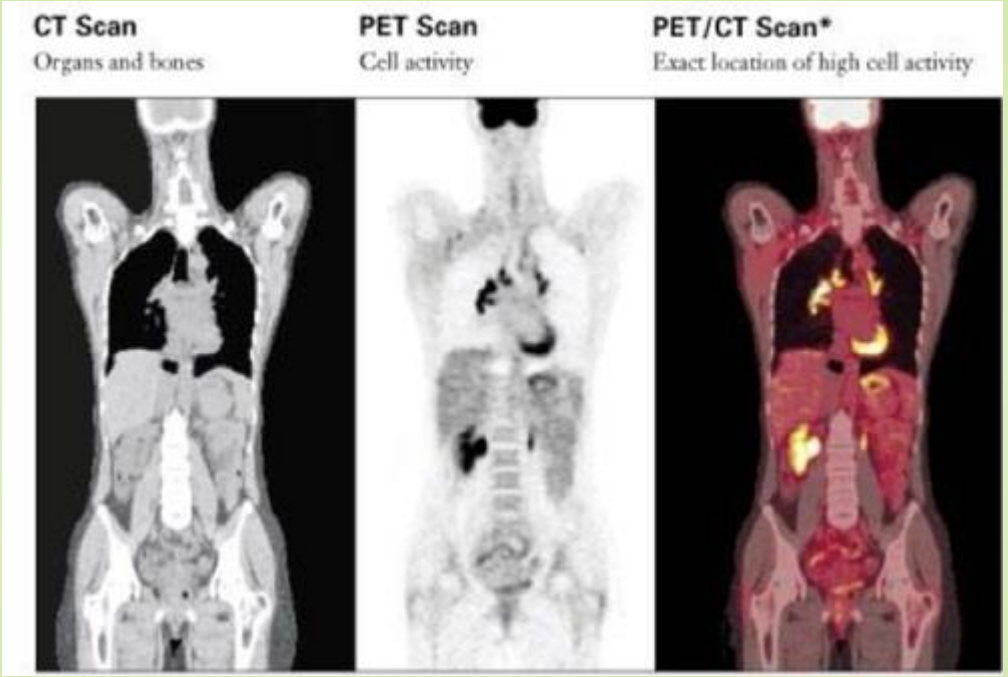
A PET scan is normally an outpatient procedure.

- Normally, the patient should not consume any food for at least 4 to 6 hours before the scan, but they should drink plenty of water. They may have to avoid caffeine for at least 24 hours before the scan.
- First, the doctor will inject a small amount of radiotracer into a vein. The tracer can also be breathed in as a gas, taken by mouth, or injected directly into an organ.
- Depending on which the organ is involved, it may take from 30 to 90 minutes for the radiotracer to reach the targeted part of the body.



Risks

- For most people, the benefits of having a PET scan outweigh the risks
- However, as a PET involves radioactive material, it is not suitable for everyone.
- Normally, a pregnant woman should not have a PET scan, as the radioactive material may affect the fetus or the infant.




Thank you