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Diagnostic techniques in nuclear medicine

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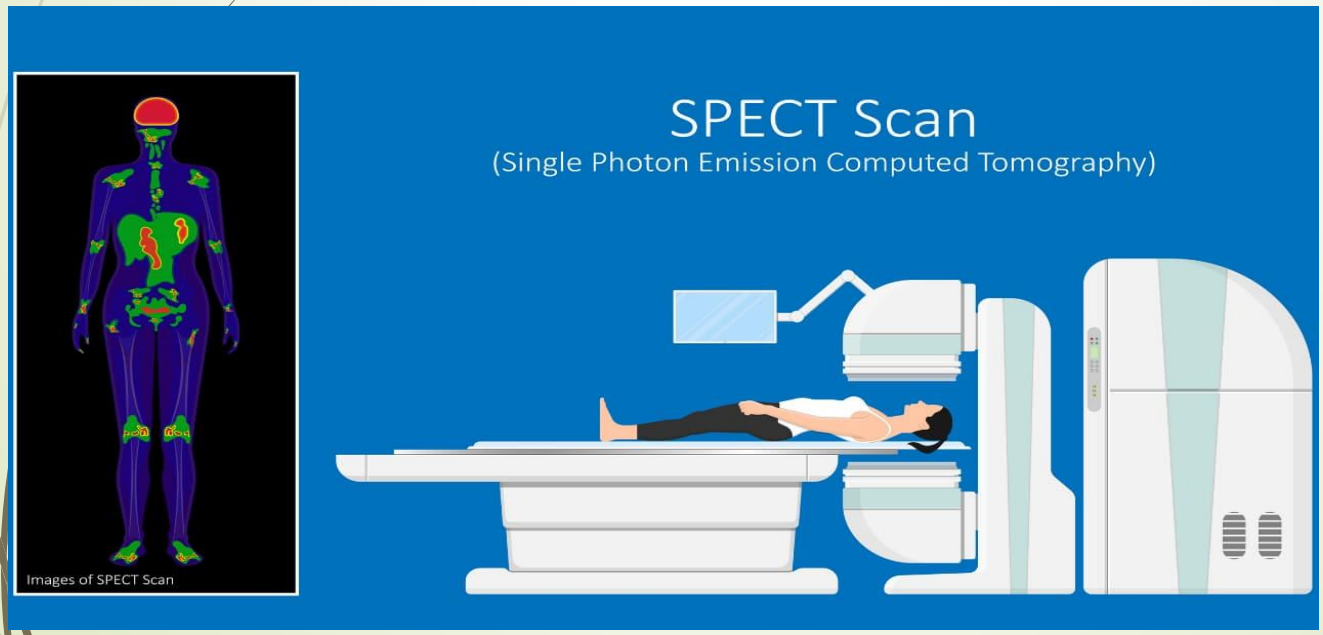
1-Single Photon Emission Computed Tomography SPECT

Use of radioactive tracers which emit gamma rays from within the body. The tracers can be given by injection, inhalation or orally. The first type is where single photons are detected by a gamma camera which can view organs from many different angles (SPECT)



2-Positron Emission Tomography (PET)

Positron Emission Tomography (PET) •It is most important clinical role in oncology, with fluorine-18 as the tracer،
since it has proven to be the most accurate non-invasive method of detecting and evaluating most cancers. It is also well used in cardiac and brain imaging.

is a functional imaging technique that uses radioactive substances known as radiotracers to visualize and measure changes in metabolic processes,

and in other physiological activities including blood flow, regional chemical composition, and absorption.

Different tracers are used for various imaging purposes, depending on the target process within the body.
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For example,

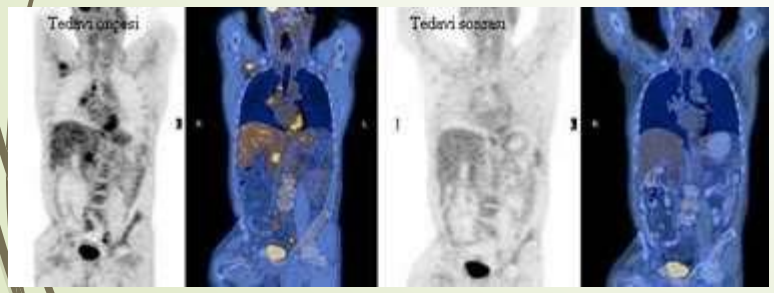
18F-FDG is commonly used to detect cancer, NaF-F18 is widely used for detecting bone formation, and oxygen-15 is sometimes used to measure blood flow.

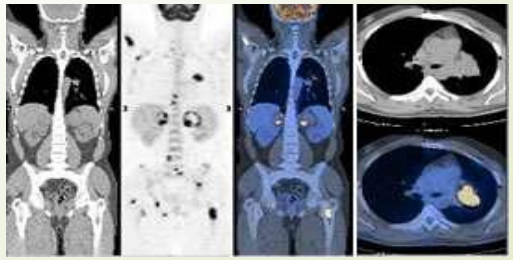
PET

3-Positron Emission Tomography - Computed Tomography PET/ CT PETCT

- New procedures combine PET with computed X-ray tomography (CT) scans to give co- registration of the two images (PETCT), enabling ٢٠% better diagnosis than with traditional gamma camera alone. It provides unique information on a wide variety of diseases from dementia to cardiovascular disease and cancer (oncology)

- A distinct advantage of nuclear imaging over X-ray techniques is that both bone and soft tissue can be imaged very successfully. The mean effective dose is 4.6 mSv per diagnostic procedure.





A positron emission tomography scan is known as a PET scan. PET scan is a type of test that may be used in cancer treatment. It can be done along with a CT scan. If so, doctors call it a PET-CT scan. But you might also just hear it called a PET scan.

For some types of cancer, a PET-CT scan is a way to help find cancer and learn its stage. Stage is a way to describe where the cancer is and if it has spread. Doctors also learn information about the stage if and how the cancer is affecting your body's functions. Knowing the stage of cancer helps you and your doctor choose the best treatment. It also helps your doctor predict your chance of recovery.

How is a PET-CT scan different than a CT scan?

A CT scan shows detailed pictures of the organs and tissues inside your body. A PET scan can find abnormal activity and it can be more sensitive than other imaging tests. It may also show changes to your body sooner. Doctors use PET-CT scans to provide more information about the cancer.

in addition to learning your cancer stage, a PET-CT scan can help the doctor:

- Find the right place for a biopsy.
- Learn if your cancer treatment is working.
- Check for new cancer growth after treatment has ended.
- Plan radiation therapy.

Diagnostic Radiopharmaceuticals

- Diagnostic Radiopharmaceuticals Diagnostic radiopharmaceuticals can be used to examine blood flow to the brain, functioning of the liver, lungs, heart or kidneys, to assess bone growth, and to confirm other diagnostic procedures .

- Another important use is to predict the effects of surgery and assess changes since treatment.

- The non-invasive nature of this technology, together with the ability to observe an organ functioning from outside the body, makes this technique a powerful diagnostic tool.

technetium-99m

•The radioisotope most widely used in medicine is technetium-99m .
It is an isotope of the artificially-produced element technetium and it has almost ideal characteristics for a nuclear medicine scan .

These are:
•It has a half-life of six hours which is long enough to examine metabolic processes yet short enough to minimise the radiation dose to the patient.

•Technetium-99m decays by a process called "isomeric"; which emits gamma rays140kev

- The low energy gamma rays it emits easily escape the human body and are accurately detected by a gamma camera .

- The chemistry of technetium is so versatile, it can form tracers by being incorporated into a range of biologically-active substances.