

Single-Photon Emission Computed Tomography (SPECT)

Overview

A single photon emission computed tomography (SPECT) scan is an imaging test that shows how blood flows to tissues and organs. It may be used to help diagnose seizures, stroke, stress fractures, infections, and tumors in the spine.

How does a SPECT scan work?

SPECT is a nuclear imaging test that integrates computed tomography (CT) and a radioactive tracer. The tracer is what allows doctors to see how blood flows to tissues and organs.

Before the SPECT scan, a tracer is injected into your bloodstream. The tracer is radiolabeled, meaning it emits gamma rays that are detected by the CT scanner. The computer collects the information emitted by the gamma rays and displays it on the CT cross-sections. These cross-sections can be added back together to form a 3D image of your brain.

The radioisotopes typically used in SPECT to label tracers are iodine-123, technetium-99m, xenon-133, thallium-201, and fluorine-18. These radioactive forms of natural elements will pass through your body and be detected by the scanner. Various drugs and other chemicals can be labeled with these isotopes.

The type of tracer used depends on what your doctor wants to measure. For example, if your doctor is looking at a tumor, he or she might use radiolabeled glucose (FDG) and watch how it is metabolized by the tumor.

The test differs from a PET scan in that the tracer stays in your blood stream rather than being absorbed by surrounding tissues, thereby limiting the images to areas where blood flows. SPECT scans are cheaper and more readily available than higher resolution PET scans.

What does a SPECT scan show?

A SPECT scan is primarily used to view how blood flows through arteries and veins in the brain. Tests have shown that it might be more sensitive to brain injury than either MRI or CT scanning because it can detect reduced blood flow to injured sites.

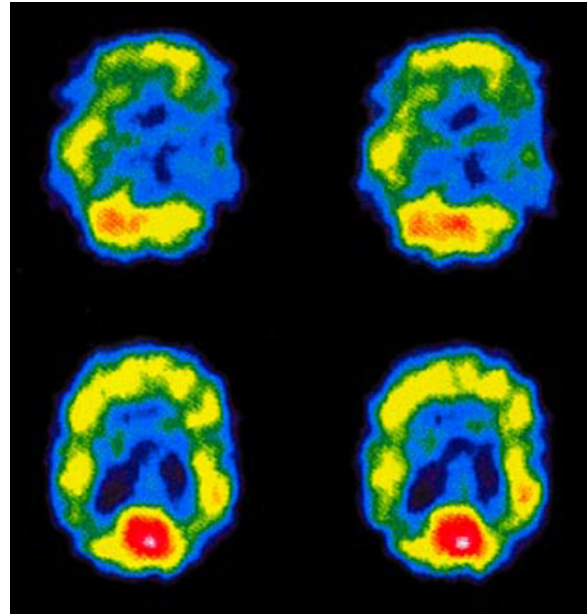


Figure 1. A SPECT scan of a patient with uncontrolled complex partial seizures. The temporal lobe on the left side of the brain shows less blood flow than the right, confirming for the surgeon the nonfunctioning area of the brain causing seizures.

SPECT scanning is also useful for presurgical evaluation of medically uncontrolled seizures (Fig. 1). The test can be performed between seizures (interictal) or during a seizure (ictal) to determine blood flow to areas where the seizures originate.

This type of scanning is also useful in diagnosing stress fractures in the spine (spondylolysis), blood deprived (ischemic) areas of brain following a stroke, and tumors.

Who performs the test?

A specially trained nuclear medicine technologist will perform the test in the Nuclear Medicine department of the hospital, or at an outpatient imaging center.

How should I prepare for the test?

Wear comfortable clothing and be prepared to stay for 1 to 2 hours.

What happens during the test?

First, you will receive an injection of a small amount of radioactive tracer. You'll be asked to rest for about 10-20 minutes until the tracer reaches your brain. Next, you'll lie comfortably on a scanner table while a special camera rotates around your head. Be sure to remain as still as possible so that the machine can take accurate pictures.

Once the scan is complete, you can leave. Be sure to drink plenty of fluids to flush the tracer from your body.

What are the risks?

The tracer is radioactive, which means your body is exposed to radiation. This exposure is limited, however, because the radioactive chemicals have short half-lives. They breakdown quickly and are removed from the body through the kidneys.

The long-term risk of radiation exposure is usually worth the benefits of diagnosing serious medical conditions. Your exposure risk could vary, however, depending on how many CT or other scans you have had. If you have concerns about your cumulative radiation exposure, talk to your doctor.

Women who are pregnant or nursing should not undergo a SPECT scan.

Some people may have an allergic reaction to the tracer or the contrast agent.

How do I get the test results?

The nuclear medicine doctor will promptly review your images and communicate directly with your referring doctor, who in turn will discuss the results with you.

Sources & links

If you have further questions about this diagnostic test, contact the doctor that ordered the test or visit www.radiologyinfo.org.

Glossary

gamma rays: electromagnetic radiation emitted during radioactive decay and having an extremely short wavelength.

glucose: a simple sugar that is a source of energy for the body and the only source of energy for the brain.

positron emission tomography (PET): a nuclear medicine test in which tissue function can be imaged. Damaged tissues have reduced metabolic activity; therefore, gamma radiation from these areas is reduced or absent.

radiolabel: the technique of attaching, or "tagging", a radioactive molecule to another molecule (such as a protein) so that it can be identified in the body. The radiolabeled substance emits positrons that can be picked up by a special scanner.

tomography: the technique of using rotating X-rays to capture an image at a particular depth in the body, bringing those structures into sharp focus while blurring structures at other depths.

tracer: a substance, usually radioactively labeled, which is injected into your body and can be followed to gain information about metabolic processes.



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