



Thyroid Scan and Uptake

Thyroid scan and uptake uses small amounts of radioactive materials called radiotracers, a special camera and a computer to provide information about your thyroid's size, shape, position and function that is often unattainable using other imaging procedures.

Tell your doctor if there's a possibility you are pregnant or if you are breastfeeding. Inform your doctor of any recent illnesses, medical conditions, allergies, medications you're taking and whether you've had any procedures within the last two months that used iodine-based contrast material. Your doctor will instruct you on how to prepare and may advise you not to eat for several hours prior to your exam. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.



What is a Thyroid Scan and Uptake?

A thyroid scan is a type of nuclear medicine imaging. The radioactive iodine uptake test (RAIU) is also known as a thyroid uptake. It is a measurement of thyroid function, but does not involve imaging.

Nuclear medicine imaging uses small amounts of radioactive material to diagnose, evaluate or treat a variety of diseases. These include many types of cancers, heart disease, gastrointestinal, endocrine or neurological disorders and other abnormalities. Because nuclear medicine exams can pinpoint molecular activity, they have the potential to identify disease in its earliest stages. They can also show whether a patient is responding to treatment.

Nuclear medicine imaging procedures are noninvasive. With the exception of intravenous injections, they are usually painless. These tests use radioactive materials called radiopharmaceuticals or radiotracers to help doctors diagnose and evaluate medical conditions.

Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material that can be detected on the PET scan. Radiotracers accumulate in tumors or regions of inflammation. They can also

bind to specific proteins in the body. The most commonly used radiotracer is F-18 fluorodeoxyglucose, or FDG, a molecule similar to glucose. Cancer cells are more metabolically active and may absorb glucose at a higher rate. This higher rate can be seen on PET scans. This allows your doctor to identify disease before it may be seen on other imaging tests. FDG is just one of many radiotracers in use or in development.

Depending on the type of exam, the radiotracer is injected, swallowed or inhaled as a gas. It eventually accumulates in the area of the body under examination. A special camera or imaging device detects radioactive emissions from the radiotracer. The camera or device produces pictures and provides molecular information.

The thyroid scan and thyroid uptake provide information about the structure and function of the thyroid. The thyroid is a gland in the neck that controls metabolism, a chemical process that regulates the rate at which the body converts food to energy.

What are some common uses of the procedure?

The thyroid scan is used to determine the size, shape and position of the thyroid gland. The thyroid uptake is performed to evaluate the function of the gland. A whole-body thyroid scan is typically performed on people who have or had thyroid cancer.

A physician may perform these imaging tests to:

- determine if the gland is working properly
- help diagnose problems with the thyroid gland, such as an overactive thyroid gland, a condition called hyperthyroidism, cancer or other growths
- assess the nature of a nodule discovered in the gland
- detect areas of abnormality, such as lumps (nodules) or inflammation
- determine whether thyroid cancer has spread beyond the thyroid gland
- evaluate changes in the gland following medication use, surgery, radiotherapy or chemotherapy

How should I prepare?

You may wear a gown during the exam or be allowed to wear your own clothing.

Women should always tell their doctor and technologist if there is any possibility that they are pregnant or they are breastfeeding. See the Safety in X-ray, Interventional Radiology and Nuclear Medicine Procedures page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

Tell the doctor and the technologist performing your exam about any medications you are taking,

including vitamins and herbal supplements. List any allergies, recent illnesses and other medical conditions.

You should tell your physician if you:

- have had any tests, such as an x-ray or CT scan, surgeries or treatments using iodinated contrast material within the last two months.
- are taking medications or ingesting other substances that contain iodine, including kelp, seaweed, cough syrups, multivitamins or heart medications.
- have any allergies to iodine, medications and anesthetics.
- are breastfeeding.

In the days prior to your examination, blood tests may be performed to measure the level of thyroid hormones in your blood. You may be told not to eat for several hours before your exam because eating can affect the accuracy of the uptake measurement.

Leave jewelry and other metallic accessories at home or remove them prior to the exam. Such objects may interfere with the procedure.

You will receive specific instructions based on the type of your scan.

What does the equipment look like?

The special camera and imaging techniques used in nuclear medicine include the gamma camera and single-photon emission-computed tomography (SPECT).

The gamma camera, also called a scintillation camera, detects radioactive energy that is emitted from the patient's body and converts it into an image. The gamma camera itself does not emit any radiation. The gamma camera is composed of radiation detectors, called gamma camera heads, which are encased in metal and plastic and most often shaped like a box, attached to a round circular donut shaped gantry. The patient lies on the examination table which slides in between two parallel gamma camera heads that are positioned above the patient. Sometimes, the gamma camera heads are oriented at a 90 degree angle and placed over the patient's body.

SPECT involves the rotation of the gamma camera heads around the patient's body to produce more detailed, three-dimensional images.

A computer helps create the images from the data obtained by the gamma camera.

A probe is a small hand-held device resembling a microphone that can detect and measure the amount of the radiotracer in a small area of your body.

How does the procedure work?

Ordinary x-ray exams create an image by passing x-rays through the body. Nuclear medicine exams use a radioactive material called a radiopharmaceutical or radiotracer. This material is injected into the bloodstream, swallowed or inhaled as a gas. The material accumulates in the area of your body under examination, where it gives off a small amount of energy in the form of gamma rays. Special cameras detect this energy and, with the help of a computer, create pictures that offer details on the structure and function of organs and tissues.

How is the procedure performed?

Nuclear medicine imaging is performed on outpatients and hospitalized patients.

Thyroid Scan

You will lie on an examination table. If necessary, a nurse or technologist will insert an intravenous (IV) catheter into a vein in your hand or arm.

Depending on your type of nuclear medicine exam, the radiotracer is injected intravenously, swallowed or inhaled as a gas.

When radiotracer is taken by mouth, in either liquid or capsule form, it is typically swallowed up to 24 hours before the scan. The radiotracer given by intravenous injection is usually given up to 30 minutes prior to the test.

When it is time for the imaging to begin, you will lie down on a moveable examination table with your head tipped backward and neck extended. The gamma camera will then take a series of images, capturing images of the thyroid gland from three different angles. You will need to remain still for brief periods of time while the camera is taking pictures.

When the examination is complete, you may be asked to wait until the technologist checks the images in case more images are needed. Sometimes, more images are obtained to clarify or better visualize certain areas or structures. The need for more images does not necessarily mean there was a problem with the exam or that something abnormal was found. It should not cause you concern.

If you had an intravenous (IV) line inserted for the procedure, it will usually be removed unless you are scheduled for another procedure that same day that requires an IV line.

Actual scanning time for a thyroid scan is 30 minutes or less.

Thyroid Uptake

You will be given radioactive iodine (I-123 or I-131) in liquid or capsule form to swallow. The thyroid uptake will begin several hours to 24 hours later. Often, two separate uptake measurements are obtained at different times. For example, you may have uptake measurements at four to six hours and 24 hours.

When it is time for the imaging to begin, you will sit in a chair facing a stationary probe positioned over the thyroid gland in the neck.

When the examination is complete, you may be asked to wait until the technologist checks the images in

case more images are needed. Sometimes, more images are obtained to clarify or better visualize certain areas or structures. The need for more images does not necessarily mean there was a problem with the exam or that something abnormal was found. It should not cause you concern.

Actual scanning time for each thyroid uptake is five minutes or less.

What will I experience during and after the procedure?

Most thyroid scan and thyroid uptake procedures are painless. However, during the thyroid scan, you may feel uncomfortable when lying completely still with your head extended backward while the gamma camera is taking images.

When the radiotracer is given intravenously, you will feel a slight pin prick when the needle is inserted into your vein for the intravenous line. You may feel a cold sensation moving up your arm when the radiotracer is injected. Generally, there are no other side effects.

When swallowed, the radiotracer has little or no taste. When inhaled, you should feel no differently than when breathing the air around you or holding your breath.

It is important to remain still during the exam. Nuclear imaging itself causes no pain. However, having to remain still or to stay in one particular position during imaging may cause discomfort.

Unless your doctor tells you otherwise, you may resume your normal activities after your exam. A technologist, nurse or doctor will provide you with any necessary special instructions before you leave.

The small amount of radiotracer in your body will lose its radioactivity over time through the natural process of radioactive decay. It may also pass out of your body through your urine or stool during the first few hours or days following the test. Drink plenty of water to help flush the radioactive material out of your body.

Who interprets the results and how do I get them?

A radiologist or other doctor specially trained in nuclear medicine will interpret the images and send a report to your referring physician.

What are the benefits vs. risks?

Benefits

- Nuclear medicine examinations provide unique information—including details on the function and anatomy of body structures—that is often unattainable using other imaging procedures.
- Nuclear medicine scans provide the most useful diagnostic or treatment information for many diseases.

- A nuclear medicine scan is less expensive and may yield more precise information than exploratory surgery.

Risks

- Because only a small dose of radiotracer is used, nuclear medicine exams have a relatively low radiation exposure. This is acceptable for diagnostic exams. Thus, the radiation risk is very low when compared with the potential benefits.
- Nuclear medicine diagnostic procedures have been used for more than five decades, and there are no known long-term adverse effects from such low-dose exposure.
- Treatment risks are always weighed against the potential benefits for nuclear medicine therapeutic procedures. Your doctor will inform you of all significant risks prior to the treatment and give you an opportunity to ask questions.
- Allergic reactions to radiotracers are extremely rare and usually mild. Always tell the nuclear medicine personnel of any allergies you may have or other problems that may have occurred during a previous nuclear medicine exam.
- Injection of the radiotracer may cause slight pain and redness. This should rapidly resolve.
- Women should always tell their doctor and radiology technologist if there is any possibility that they are pregnant or they are breastfeeding. See the Safety in X-ray, Interventional Radiology and Nuclear Medicine Procedures page for more information about pregnancy, breastfeeding and nuclear medicine imaging.

What are the limitations of the Thyroid Scan and Uptake?

The thyroid scan and thyroid uptake are not performed on patients who are pregnant because of the risk of exposing the fetus to radiation. These tests are also not recommended for breastfeeding women.

Nuclear medicine procedures can be time consuming. It can take several hours to days for the radiotracer to accumulate in the area of interest, and imaging may take up to several hours to perform. In some cases, newer equipment can substantially shorten the procedure time.

The image resolution of nuclear medicine images may not be as high as that of CT or MRI. However, nuclear medicine scans are more sensitive for a variety of indications, and the functional information they yield is often unobtainable by other imaging techniques.

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