



## 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 is a branch of medical imaging that uses small amounts of radioactive material to diagnose and determine the severity of or treat a variety of diseases, including many types of cancers, heart disease, gastrointestinal, endocrine, neurological disorders and other abnormalities within the body. Because nuclear medicine procedures are able to pinpoint molecular activity within the body, they offer the potential to identify disease in its earliest stages as well as a patient's immediate response to therapeutic interventions.

Nuclear medicine imaging procedures are noninvasive and, with the exception of intravenous injections, are usually painless medical tests that help physicians diagnose and evaluate medical conditions. These imaging scans use radioactive materials called radiopharmaceuticals or radiotracers.

Radiotracers are molecules linked to, or "labeled" with, a small amount of radioactive material that can be

detected on the PET scan. They are designed to accumulate in cancerous tumors or regions of inflammation. They can also be made to 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 may absorb glucose at a higher rate, being more metabolically active. This higher rate can be seen on PET scans, and that 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 for a variety of conditions throughout the body.

Depending on the type of nuclear medicine exam, the radiotracer is either injected into the body, swallowed or inhaled as a gas and eventually accumulates in the organ or area of the body being examined. Radioactive emissions from the radiotracer are detected by a special camera or imaging device that 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 be asked to wear a gown during the exam or you may be allowed to wear your own clothing.

Women should always inform their physician or technologist if there is any possibility that they are pregnant or if they are breastfeeding. See the Safety page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

You should inform your physician and the technologist performing your exam of any medications you are taking, including vitamins and herbal supplements. You should also inform them if you have any allergies and about recent illnesses or 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.

Jewelry and other metallic accessories should be left at home if possible, or removed prior to the exam because they may interfere with the procedure.

You will receive specific instructions based on the type of scan you are undergoing.

## 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 and beneath the examination table. 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 aids in creating 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?

With ordinary x-ray examinations, an image is made by passing x-rays through the patient's body. In contrast, nuclear medicine procedures use a radioactive material, called a radiopharmaceutical or radiotracer, which is injected into the bloodstream, swallowed or inhaled as a gas. This radioactive material accumulates in the organ or area of your body being examined, 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 offering details on both the structure and function of organs and tissues in your body.

## How is the procedure performed?

Nuclear medicine imaging is usually performed on an outpatient basis, but is often performed on hospitalized patients as well.

### Thyroid Scan

You will be positioned 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 the type of nuclear medicine exam you are undergoing, the dose of radiotracer is then 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 completed, you may be asked to wait until the technologist checks the images in case additional images are needed. Occasionally, more images are obtained for clarification or better visualization of certain areas or structures. The need for additional images does not necessarily mean there was a problem with the exam or that something abnormal was found, and should not be a cause of concern for you.

If you had an intravenous line inserted for the procedure, it will usually be removed unless you are scheduled for an additional procedure that same day that requires an intravenous 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 completed, you may be asked to wait until the technologist checks the images in case additional images are needed. Occasionally, more images are obtained for clarification or better visualization of certain areas or structures. The need for additional images does not necessarily mean there was a problem with the exam or that something abnormal was found, and should not be a cause of

concern for you.

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. When the radioactive material is injected into your arm, you may feel a cold sensation moving up your arm, but there are generally no other side effects.

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

It is important that you remain still while the images are being recorded. Though nuclear imaging itself causes no pain, there may be some discomfort from having to remain still or to stay in one particular position during imaging.

Unless your physician tells you otherwise, you may resume your normal activities after your nuclear medicine scan. If any special instructions are necessary, you will be informed by a technologist, nurse or physician before you leave the nuclear medicine department.

Through the natural process of radioactive decay, the small amount of radiotracer in your body will lose its radioactivity over time. It may also pass out of your body through your urine or stool during the first few hours or days following the test. You should also drink plenty of water to help flush the radioactive material out of your body as instructed by the nuclear medicine personnel.

## Who interprets the results and how do I get them?

A radiologist or other physician who has specialized training 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 both function and anatomic structure of the body that is often unattainable using other imaging procedures.
- For many diseases, nuclear medicine scans yield the most useful information needed to make a diagnosis or to determine appropriate treatment, if any.

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

## Risks

- Because the doses of radiotracer administered are small, diagnostic nuclear medicine procedures result in relatively low radiation exposure to the patient, acceptable for diagnostic exams. Thus, the radiation risk is very low 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.
- The risks of the treatment are always weighed against the potential benefits for nuclear medicine therapeutic procedures. You will be informed of all significant risks prior to the treatment and have an opportunity to ask questions.
- Allergic reactions to radiopharmaceuticals may occur but are extremely rare and are usually mild. Nevertheless, you should inform 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 which should rapidly resolve.
- Women should always inform their physician or radiology technologist if there is any possibility that they are pregnant or if they are breastfeeding. See the Safety page for more information about pregnancy, breastfeeding and nuclear medicine exams.

## 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 body part of interest and imaging may take up to several hours to perform, though in some cases, newer equipment is available that can substantially shorten the procedure time.

The resolution of structures of the body with nuclear medicine may not be as high as with other imaging techniques, such as CT or MRI. However, nuclear medicine scans are more sensitive than other techniques for a variety of indications, and the functional information gained from nuclear medicine exams is often unobtainable by other imaging techniques.

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