



## Lymphoscintigraphy

Lymphoscintigraphy helps evaluate your body's lymphatic system for disease using small amounts of radioactive materials called radiotracers that are typically injected into the bloodstream, inhaled, swallowed, or in the case of lymphoscintigraphy, injected into the skin. The radiotracer travels through the area being examined and gives off energy in the form of gamma rays which are detected by a special camera and a computer to create images of the inside of your body. Because it is able to pinpoint molecular activity within the body, lymphoscintigraphy offers the potential to identify lymphatic disease in its earliest stages.



Tell your doctor if there's a possibility you are pregnant or if you are breastfeeding. Discuss any recent illnesses, medical conditions, allergies and medications you're taking, including vitamins and herbal supplements. Your doctor will instruct you on how to prepare. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

## What is Lymphoscintigraphy?

Lymphoscintigraphy is a special type of nuclear medicine imaging that provides pictures called scintigrams of the lymphatic system.

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 lymphatic system is a network of small channels similar to blood vessels that circulate the fluid (called lymph) and cells (lymphocytes) of the immune system throughout the body. Lymph nodes, which act like a filter for foreign bodies such as germs, viruses and pollen, are located along this network.

## What are some common uses of the procedure?

Physicians perform lymphoscintigraphy to:

- identify the sentinel lymph node, or the first node to receive the lymph drainage from a tumor.
- plan a biopsy or surgery that will help assess the stage of cancer and create a treatment plan.
- identify points of blockage in the lymphatic system, such as lymph flow in an arm or leg, or lymphedema.

## 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.

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.

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.

The radiotracer will be injected just beneath the skin, or sometimes deeper, using a very small needle.

Immediately after the injection, the gamma camera will take a series of images of the area of the body being studied.

When it is time for the imaging to begin, the camera or scanner will take a series of images. The camera may rotate around you or it may stay in one position and you may be asked to change positions in

between images. While the camera is taking pictures, you will need to remain still for brief periods of time. In some cases, the camera may move very close to your body. This is necessary to obtain the best quality images. If you are claustrophobic, you should inform the technologist before your exam begins.

The type of study you are having will determine the location of your injection and the number of scans performed.

- **Melanoma cancer patients** — Two to five doses of radiotracer are injected into the skin or other tissue surrounding the site of the melanoma. Images may be taken of the arms and underarms, legs and groins, or head, neck and chest, or other areas, depending on the site of the melanoma. Your skin will be marked to show where your lymph nodes are located. Imaging for this procedure usually takes about one to two hours, but may take up to three to four hours.
- **Breast cancer** — The radiotracer may be injected in multiple sites near the tumor and/or around the areola, or nipple. The breast, chest and underarm regions will be imaged. Imaging usually is completed within 30 minutes to one hour, but may take up to two or more hours.
- **Leg or arm swelling (edema)** — The radiotracer is injected between the first and second fingers or toes of each hand or foot. Both the swollen and healthy arm or leg will be imaged so that the two sides can be compared. Depending on the degree of lymphatic obstruction and the cause, imaging may take 30 minutes to several hours.

For some procedures, you may also be asked to exercise lightly for about 10 minutes—walking for leg exams or doing handgrip or lifting exercises for arm exams. Additional images are taken once you complete these exercises.

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.

## **What will I experience during and after the procedure?**

Except for intravenous injections, most nuclear medicine procedures are painless. They are rarely associated with significant discomfort or side effects.

No anesthesia is needed for a scintigram unless a lymph node biopsy is performed in the operating room following the procedure.

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.

For lymphoscintigraphy or sentinel node studies, the radiotracer is not injected intravenously, but rather

near the tumor site.

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

- This nuclear medicine test has essentially replaced the more complex procedure formerly used to assess the lymphatic system as well as to determine the spread of cancer to lymph nodes (lymphangiography).
- Lymphoscintigraphy allows for a less extensive surgery to be performed which has fewer side effects and a lower morbidity rate compared to more radical surgery (axillary lymph node dissection ).
- 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 Lymphoscintigraphy?

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.

## Disclaimer

This information is copied from the RadiologyInfo Web site (<http://www.radiologyinfo.org>) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at <http://www.radiologyinfo.org> to view or download the latest information.

**Note:** Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

## Copyright

This material is copyrighted by either the Radiological Society of North America (RSNA), 820 Jorie Boulevard, Oak Brook, IL 60523-2251 or the American College of Radiology (ACR), 1891 Preston White Drive, Reston, VA 20191-4397. Commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is prohibited.

Copyright © 2020 Radiological Society of North America, Inc.