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 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 radiopharmaceuticalsor 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 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 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.

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.

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.

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 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.

What will I experience during and after the procedure?

Except for intravenous injections, most nuclear medicine procedures are painless and 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. 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.

For lymphoscintigraphy or sentinel node studies, the radiotracer is not injected intravenously, but rather near the tumor site.

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

- 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).
- Lymphoscinitigraphy 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 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 Lymphoscintigraphy?

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.