



## Skeletal Scintigraphy (Bone Scan)

Skeletal scintigraphy helps diagnose and evaluate a variety of bone diseases and conditions using small amounts of radioactive materials called radiotracers that are typically injected into the bloodstream, inhaled or swallowed. 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, skeletal scintigraphy offers the potential to identify disease in its earliest stages.



Tell your doctor if there's a possibility you are pregnant or if you are breastfeeding. Discuss whether you have recently taken a bismuth-containing medicine such as Pepto-Bismol or had a barium contrast x-ray. 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 and will likely tell you to drink extra fluids after the radiotracer is injected. You may have to wait several hours between the radiotracer injection and the bone scan so you may want to bring something to read or work on. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

## What is skeletal scintigraphy (bone scan)?

Skeletal scintigraphy is a special type of nuclear medicine procedure that uses small amounts of radioactive material to diagnose and assess the severity of a variety of bone diseases and conditions, including fractures, infection, and cancer.

Nuclear medicine imaging procedures are noninvasive and—with the exception of intravenous injections—usually painless medical tests that help physicians diagnose and evaluate medical conditions. These imaging scans use radioactive materials called radiopharmaceuticals or radiotracers. Radioactive energy emitted from the radiotracer is detected by a special camera or imaging device that produces pictures of the bones called scintigrams. Abnormalities are indicated by areas of abnormal bone that take up more or less of the radiopharmaceutical which appear brighter or darker than normal bone on the

scintigram.

Because nuclear medicine procedures are able to image the functions of the body at the molecular level, they offer the potential to identify disease in its earliest stages as well as a patient's immediate response to therapeutic interventions. In fact, a skeletal scintigram or bone scan can often find bone abnormalities much earlier than a regular x-ray exam.

## What are some common uses of the procedure?

Physicians order skeletal scintigraphy to:

- find bone cancer or determine whether cancer from another area of the body, such as the breast, lung or prostate gland, has spread to the bones.
- diagnose the cause or location of unexplained bone pain, such as ongoing low back pain.
- help determine the location of an abnormal bone in complex bone structures, such as the foot or spine. Follow-up evaluation may then be done with a computed tomography (CT) or magnetic resonance imaging (MRI) scan.
- diagnose broken bones, such as a stress fracture or a hip fracture, not clearly seen on x-rays.
- find bone damage caused by infection or other conditions, such as Paget disease.

## How should I prepare?

You should inform your physician and the technologist performing your exam of any medications you are taking, including vitamins and herbal supplements and if you have allergies, have recently been ill or suffer from any other medical condition.

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

Women who are breastfeeding will need to use formula for one to two days after the scan until the radioactive tracer is gone from their bodies. Be sure to dispose of any breast milk during this time.

You should inform the physician if you have taken a bismuth-containing medicine like Pepto-Bismol or if you have had an x-ray test using barium contrast material within the past four days. Barium and bismuth can interfere with bone scan results.

You will be asked to drink extra fluids after the radiotracer is injected, so limit your fluids for up to four hours before the test. You probably will have to wait several hours between injection of the tracer and the bone scan, so you may want to bring something to read or work on to pass the time.

You will be asked to wear a gown during the exam.

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 and below the examination table and located 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.

## 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?

A nuclear medicine technologist will perform the skeletal scintigraphy procedure.

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 technologist will administer the radiopharmaceutical into a vein in your hand or arm. It takes a few hours, usually two to four hours, for the radiotracer to circulate through your body and bind to your bones so that the pictures can be taken. During this time, you'll be asked to drink four to six glasses of water to remove any unnecessary radiotracer from your body that does not localize to the bones. You will also be asked to empty your bladder before the scan begins to prevent any tracer in the urine from blocking the view of your pelvic bones during the scan.

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 will 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. For some types of bone scans, pictures are taken during the tracer injection, immediately afterward, and then three to five hours after the injection. These types of exams are known as three-phase bone scans.

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.

## **What will I experience during and after 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.

The bone scan itself is usually painless and is rarely associated with significant discomfort or side effects. No anesthesia is needed for skeletal scintigraphy, and sedation is rarely necessary. The test may be uncomfortable if you are having joint or bone pain. Try to relax by breathing slowly and deeply.

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.

Children in particular may experience discomfort from having to remain still during imaging. Parents are encouraged to stay with their children to help them remain calm and still during imaging. Comfort items such as pacifiers, blankets and books are also very helpful. Often, a television with children's programming and/or children's DVDs is available in the scanning room. For more information, see [Children's \(Pediatric\) Nuclear Medicine](#) .

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.

The amount of radiation is so small that it is not a risk for people to come in contact with you after the

test.

## 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.
- Nuclear medicine is less expensive and may yield more precise information than exploratory surgery.
- Skeletal scintigraphy helps physicians evaluate the condition of your bones and detect fractures and other abnormalities that may be missed in a Bone Radiography or X-ray exam.
- Scintigraphy can provide early detection of primary cancer and cancer that has spread to the bones from other parts of the body.
- Scintigraphy can detect osteomyelitis, an infection of the bone or bone marrow.
- Scintigraphy helps monitor the effects of treatment on bone abnormalities.
- The procedure is free from acute or long-term side effects, and except in cases of very young patients, sedation is seldom necessary.

### Risks

- 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.
- There is always a slight risk of damage to cells or tissue from being exposed to any radiation, including the low level of radiation released by the tracer in this test.
- The procedure can expose a developing fetus to radiation, and the radiopharmaceuticals can be transmitted to the baby through breast milk.

## What are the limitations of Skeletal Scintigraphy?

Bone scans cannot identify some types of cancer.

Occasionally, an abnormal finding on a bone scan may require additional tests like CT, MR imaging,

blood tests or a biopsy to help distinguish between normal and abnormal bone.

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.

## 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 © 2017 Radiological Society of North America, Inc.