

Bone Scan

A bone scan (skeletal scintigraphy) helps to diagnose and evaluate a variety of bone diseases and conditions using small amounts of radioactive materials called radiotracers that are injected into the bloodstream. The radiotracer travels through the area being examined and gives off radiation in the form of gamma rays which are detected by a special gamma camera and a computer to create images of your bones. 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 a bone scan?

A 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 response to therapeutic interventions. In fact, a 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 (<https://www.radiologyinfo.org/en/info/safety-radiation>) 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 radiotracer 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.

Leave jewelry and accessories at home or remove them prior to the exam. These objects 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?

Nuclear medicine uses a special gamma camera and single-photon emission-computed tomography (SPECT) imaging techniques.

The gamma camera records the energy emissions from the radiotracer in your body and converts it into an image. The gamma camera itself does not emit any radiation. It has radiation detectors called gamma camera heads. These are encased in metal and plastic, often shaped like a box, and attached to a round, donut-shaped gantry. The patient lies on an exam table that slides in between two parallel gamma camera heads, above and beneath the patient. Sometimes, the doctor will orient the gamma camera heads at a 90-degree angle over the patient's body.

In SPECT, the gamma camera heads rotate around the patient's body to produce detailed, three-dimensional images.

A computer creates the images using the data from the gamma camera.

How does the procedure work?

Ordinary x-ray exams pass x-rays through the body to create an image. Nuclear medicine uses radioactive materials called radiopharmaceuticals or radiotracers. Your doctor typically injects this material into your bloodstream. Or you may swallow it or inhale it as a gas. The material accumulates in the area under examination, where it gives off gamma rays. Special cameras detect this energy and, with the help of a computer, create pictures that detail how your organs and tissues look and function.

How is the procedure performed?

A nuclear medicine technologist will perform the skeletal scintigraphy procedure.

You will lie on an exam 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 travel 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 imaging begins, the camera or scanner will take a series of images. The camera may rotate around you or stay in one position. You may need to change positions in between images. While the camera is taking pictures, you will need to remain still for brief periods. In some cases, the camera may move very close to your body. This is necessary to obtain the best quality images. Tell the technologist if you have a fear of closed spaces 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 radiotracer injection, immediately afterward, and then three to five hours after the injection. These types of exams are known as three-phase bone scans.

After the exam, you may need to wait until the technologist determines if more images are needed. Sometimes, the technologist takes more images 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 is abnormal. It should not cause you concern.

What will I experience during and after the procedure?

You will feel a slight pin prick when the technologist inserts the needle into your vein for the intravenous line. You may feel a cold sensation moving up your arm during the radiotracer injection. Generally, there are 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 to remain still during the exam. Nuclear imaging causes no pain. However, having to remain still or in one position for long periods may cause discomfort.

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 (<https://www.radiologyinfo.org/en/info/nuclear-pdi>)*.

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 after the test. Drink plenty of water to help flush the material out of your body.

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 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 exams provide unique information that is often unattainable using other imaging procedures. This information may include details on the function and anatomy of body structures.
- Nuclear medicine supplies 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.
- Bone scan 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* (<https://www.radiologyinfo.org/en/info/bonerad>) exam.
- Bone scan can provide early detection of primary cancer and cancer that has spread to the bones from other parts of the body.
- Bone scan can detect osteomyelitis, an infection of the bone or bone marrow.
- Bone scan 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 radiotracers are extremely rare and usually mild. Always tell the nuclear medicine personnel about any allergies you may have. Describe any problems you may have had during previous nuclear medicine exams.
- The radiotracer injection may cause slight pain and redness. This 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 of the radiotracer used in this test.
- The procedure can expose a developing fetus to radiation, and the radiotracer can be transmitted to the baby through breast milk.

What are the limitations of bone scans?

Bone scans cannot identify some types of cancer.

Occasionally, an abnormal finding on a bone scan may require additional tests like CT, MRI, 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 area of interest. Plus, 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. The functional information they yield is often unobtainable using other imaging techniques.

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