

Bone Density Scan (DEXA)

This procedure is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is a Bone Density Scan (DEXA)?

Bone density scanning, also called dual-energy x-ray absorptiometry (DXA or DEXA) or bone densitometry, is an enhanced form of x-ray technology that is used to measure bone loss. DEXA is today's established standard for measuring bone mineral density (BMD).

An x-ray (radiograph) is a painless medical test that helps physicians diagnose and treat medical conditions. Radiography involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body. X-rays are the oldest and most frequently used form of medical imaging.

DEXA is most often performed on the lower spine and hips. Portable DEXA devices, including some that use ultrasound waves rather than x-rays, measure the wrist, fingers or heel and are sometimes used for screening purposes.

What are some common uses of the procedure?

DEXA bone densitometry is most often used to diagnose osteoporosis, a condition that often affects women after menopause but may also be found in men. Osteoporosis involves a gradual loss of calcium, causing the bones to become thinner, more fragile and more likely to break.

DEXA is also effective in tracking the effects of treatment for osteoporosis and other conditions that cause bone loss.

The DEXA test can also assess an individual's risk for developing fractures.

Bone density testing is strongly recommended if you:

- are a post-menopausal woman and not taking estrogen.
- have a personal or maternal history of hip fracture or smoking.
- are a post-menopausal woman who is tall (over 5 feet 7 inches) or thin (less than 125 pounds).
- are a man with clinical conditions associated with bone loss.
- use medications that are known to cause bone loss, including corticosteroids such as Prednisone, various anti-seizure medications such as Dilantin and certain barbiturates, or high-dose thyroid replacement drugs.
- have type 1 (formerly called juvenile or insulin-dependent) diabetes, liver disease, kidney disease or a family history of osteoporosis.
- have high bone turnover, which shows up in the form of excessive collagen in urine samples.
- have a thyroid condition, such as hyperthyroidism.
- have experienced a fracture after only mild trauma.
- have had x-ray evidence of vertebral fracture or other signs of osteoporosis.

The Lateral Vertebral Assessment (LVA), a low-dose x-ray examination of the spine to screen for vertebral fractures that is performed on the DEXA machine, may be recommended for older patients, especially if:

- they have lost more than an inch of height
- have unexplained back pain
- if a DEXA scan gives borderline readings.

How should I prepare?

On the day of the exam you may eat normally. You should not take calcium supplements for at least 24 hours before your exam.

You should wear loose, comfortable clothing, avoiding garments that have zippers, belts or buttons made of metal.

You may be asked to remove some or all of your clothes and to wear a gown during the exam. You may also be asked to remove jewelry, eye glasses and any metal objects or clothing that might interfere with the x-ray images.

Inform your physician if you recently had a barium examination or have been injected with a contrast material for a computed tomography (CT) scan or radioisotope scan. You may have to wait 10 to 14 days before undergoing a DEXA test.

Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy because radiation can be harmful to the fetus. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby.

What does the equipment look like?

There are two types of DEXA equipment: a central device and a peripheral device.

Central DEXA devices measure bone density in the hip and spine and are usually located in hospitals and medical offices. Central devices have a large, flat table and an "arm" suspended overhead. The arm swings away so that the table can be used as a treatment table or exam chair for routine patient examinations.

Peripheral DEXA (pDEXA) devices measure bone density in the wrist, heel or finger and are often available in drugstores and on mobile health vans in the community. The pDEXA device is much smaller than the Central DEXA device, weighing only about 60 pounds. It is a portable box-like structure with a space for the foot or forearm to be placed for imaging.

How does the procedure work?

The DEXA machine sends a thin, invisible beam of low-dose x-rays with two distinct energy peaks through the bones being examined. One peak is absorbed mainly by

soft tissue and the other by bone. The soft tissue amount can be subtracted from the total and what remains is a patient's bone mineral density.

DEXA machines feature special software that compute and display the bone density measurements on a computer monitor.

How is it performed?

This examination is usually done on an outpatient basis.

In the Central DEXA examination, which measures bone density in the hip and spine, the patient lies on a padded table. An x-ray generator is located below the patient and an imaging device, or detector, is positioned above.

To assess the spine, the patient's legs are supported on a padded box to flatten the pelvis and lower (lumbar) spine. To assess the hip, the patient's foot is placed in a brace that rotates the hip inward. In both cases, the detector is slowly passed over the area, generating images on a computer monitor.

The patient must hold very still and may be asked to keep from breathing for a few seconds while the x-ray picture is taken to reduce the possibility of a blurred image. The technologist will walk behind a wall or into the next room to activate the x-ray machine.

The peripheral DEXA (pDEXA) test is even simpler. The patient's finger, hand, forearm or foot is placed a small device that obtains a bone density reading within a few minutes.

An additional procedure called Lateral Vertebral Assessment (LVA) is now being done at many centers. LVA is a low-dose x-ray examination of the spine to screen for vertebral fractures that is performed on the DEXA machine.

The LVA test adds only a few minutes to the DEXA procedure.

The DEXA bone density test is usually completed within 10 to 30 minutes, depending on the equipment used and the parts of the body being examined.

What will I experience during and after the x-ray procedure?

Bone density tests are a quick and painless procedure.

Who interprets the results and how will I get them?

A radiologist, a physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care or referring physician, who will share the results with you.

DEXA scans are also interpreted by other physicians such as rheumatologists and endocrinologists.

Your test results will be in the form of two scores:

T score — This number shows the amount of bone you have compared with a young adult of the same gender with peak bone mass. A score above -1 is considered normal. A score between -1 and -2.5 is classified as osteopenia, the first stage of bone loss. A score below -2.5 is defined as osteoporosis. The T score is used to estimate your risk of developing a fracture.

Z score — This number reflects the amount of bone you have compared with other people in your age group and of the same size and gender. If this score is unusually high or low, it may indicate a need for further medical tests.

Small changes may normally be observed between scans due to differences in positioning and usually are not significant.

What are the benefits vs. risks?

Benefits

- DEXA bone densitometry is a simple, quick and non-invasive procedure.
- No anesthesia is required.
- The amount of radiation used is extremely small—less than one-tenth the dose of a standard chest x-ray.
- DEXA bone density testing is the most accurate method available for the diagnosis of osteoporosis and is also considered an accurate estimator of fracture risk.
- DEXA equipment is widely available making DEXA bone densitometry testing convenient for patients and physicians alike.
- No radiation remains in a patient's body after an x-ray examination.
- X-rays usually have no side effects.

Risks

- There is always a slight chance of damage to cells or tissue from radiation. However, the radiation risk is very low compared with the potential benefits.
- The effective radiation dose from this procedure is about 0.01 mSv, which is about the same as the average person receives from background radiation in one day.
- Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant.
- No complications are expected with the DEXA procedure.

A Word About Minimizing Radiation Exposure

Special care is taken during x-ray examinations to use the lowest radiation dose possible while producing the best images for evaluation. National and international radiology protection councils continually review and update the technique standards used by radiology professionals.

State-of-the-art x-ray systems have tightly controlled x-ray beams with significant filtration and dose control methods to minimize stray or scatter radiation. This ensures those parts of a patient's body not being imaged receive minimal radiation exposure.

What are the limitations of DEXA Bone Densitometry?

- A DEXA test cannot predict who will experience a fracture but can provide indications of relative risk.
- Despite its effectiveness as a method of measuring bone density, DEXA is of limited use in people with a spinal deformity or those who have had previous spinal surgery. The presence of vertebral compression fractures or osteoarthritis may interfere with the accuracy of the test; in such instances, CT scans may be more useful.
- Central DEXA devices are more sensitive than pDEXA devices but they are also somewhat more expensive.
- A test done on a peripheral location, such as the heel or wrist, may help predict the risk of fracture in the spine or hip. But because bone mass tends to vary from one location to the other, measuring the heel is not as accurate as measuring the spine or hip.

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