RadiologyInfo.org
For patients

Bone Density Scan (DEXA or DXA)



Bone densitometry, also called dual-energy x-ray absorptiometry, DEXA or DXA, uses a very small dose of ionizing radiation to produce pictures of the inside of the body (usually the lower (or lumbar) spine and hips) to measure bone loss. It is commonly used to diagnose osteoporosis, to assess an individual's risk for developing osteoporotic fractures. DXA is simple, quick and noninvasive. It's also the most commonly used and the most standard method for diagnosing osteoporosis.

This exam requires little to no special preparation. Tell your doctor and the technologist if there is a possibility you are pregnant or if you recently had a barium exam or received an injection of contrast material for a CT or radioisotope scan. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown. You should not take calcium supplements for at least 24 hours before your exam.

What is a bone density Scan?

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

An x-ray exam helps doctors diagnose and treat medical conditions. It exposes you to a small dose of ionizing radiation (http://www.radiologyinfo.org) to produce pictures of the inside of the body. X-rays are the oldest and most often used form of medical imaging.

DXA is most often performed on the lower spine and hips. In children and some adults, the whole body is sometimes scanned. Peripheral devices that use x-ray or ultrasound are sometimes used to screen for low bone mass, mostly at the forearm. In some communities, a CT scan with special software can also be used to diagnose or monitor low bone mass (QCT). This is accurate but less commonly used than DXA scanning.

What are some common uses of the procedure?

DXA is most often used to diagnose osteoporosis (https://www.radiologyinfo.org/en/info/osteoporosis) , a condition that often affects women after menopause but may also be found in men and rarely in children. Osteoporosis involves a gradual loss of bone, as well as structural changes, causing the bones to become thinner, more fragile and more likely to break.

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

The DXA test can also assess an individual's risk for developing fractures. The risk of fracture is affected by age, body weight, history of prior fracture, family history of osteoporotic fractures and life style issues such as cigarette smoking and excessive alcohol consumption. These factors are taken into consideration when deciding if a patient needs therapy.

Bone density testing is strongly recommended if you:

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- 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, such as rheumatoid arthritis, chronic kidney or liver disease.
- 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 (http://www.radiologyinfo.org) .
- have a parathyroid condition, such as hyperparathyroidism (http://www.radiologyinfo.org) .
- have experienced a fracture after only mild trauma.
- have had x-ray evidence of vertebral fracture or other signs of osteoporosis.

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

- they have lost more than an inch of height.
- have unexplained back pain.
- if a DXA scan gives borderline readings.
- the DXA images of the spine suggest a vertebral deformity or fracture.

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. Objects such as keys or wallets that would be in the area being scanned should be removed.

You may need to remove some clothing and/or change into a gown for the exam. Remove jewelry, removable dental appliances, eyeglasses, and any metal objects or clothing that might interfere with the x-ray images.

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

Women should always tell their doctor and technologist (http://www.radiologyinfo.org) if they are pregnant. Doctors will not perform many tests during pregnancy to avoid exposing the fetus (http://www.radiologyinfo.org) to radiation. If an x-ray is necessary, the doctor will take precautions to minimize radiation exposure to the baby. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) page for more information about pregnancy and x-rays.*

What does the equipment look like?

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

Most of the devices used for DXA are central devices, which are used to measure bone density in the hip and spine. They are usually located in hospitals and medical offices. Central devices have a large, flat table and an "arm" suspended overhead.

Peripheral devices measure bone density in the wrist, heel or finger and are often available in drugstores and on mobile health vans

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in the community. The pDXA devices are smaller than the central DXA devices, weighing only about 60 pounds. They may have a portable box-like structure with a space for the foot or forearm to be placed for imaging. Other portable technologies such as specially designed ultrasound machines, are also sometimes used for screening. However, central DXA is the standard technique.

How does the procedure work?

The DXA 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.

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

How is the procedure performed?

Your doctor will likely do this exam on an outpatient basis.

In the central DXA examination, which measures bone density of 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 (http://www.radiologyinfo.org)) 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.

You must hold very still and may need to hold your breath for a few seconds while the technologist (http://www.radiologyinfo.org) takes the x-ray. This helps 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 tests are simpler. The finger, hand, forearm or foot is placed in a small device that obtains a bone density reading within a few minutes.

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

The VFA test adds only a few minutes to the DXA procedure.

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

You will probably be asked to fill out a questionnaire that will help the doctor determine if you have medical conditions or take certain medications that either increase or decrease your risk of a fracture. The World Health Organization has recently released an online survey that combines the DXA results and a few basic questions and can be used to predict 10-year risk of hip fracture or other major osteoporotic fractures for post-menopausal women.

What will I experience during and after the procedure?

Bone density tests are a quick and painless procedure.

Routine evaluations every two years may be needed to see a significant change in bone mineral density, decrease or increase. Few patients, such as patients on high dose steroid medication, may need follow-up at six months.

Who interprets the results and how will I get them?

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A radiologist (https://www.radiologyinfo.org/en/info/article-your-radiologist) , a doctor trained to supervise and interpret radiology examinations, will analyze the images. The radiologist will send a signed report to your primary care or referring physician (http://www.radiologyinfo.org) who will discuss the results (https://www.radiologyinfo.org/en/info/all-about-your-radiology-report) with you.

DXA scans are also interpreted by other physicians such as rheumatologists and endocrinologists. A clinician should review your DXA scan while assessing the presence of clinical risk factors such as:

- rheumatoid arthritis
- chronic renal and liver disease
- respiratory disease
- inflammatory bowel disease

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 of -1 and above is considered normal. A score between -1.1 and -2.4 is classified as osteopenia (http://www.radiologyinfo.org) (low bone mass). A score of -2.5 and below is defined as osteoporosis. The T score is used to estimate your risk of developing a fracture and also to determine if treatment is required.

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

- DXA bone densitometry is a simple, quick and noninvasive (http://www.radiologyinfo.org) procedure.
- No anesthesia (http://www.radiologyinfo.org) is required.
- The amount of radiation used is extremely small—less than one-tenth the dose of a standard chest x-ray, and less than a day's exposure to natural radiation.
- DXA bone density testing is currently the best standardized method available to diagnose osteoporosis and is also considered an accurate estimator of fracture risk.
- DXA is used to make a decision whether treatment is required and it can be used to monitor the effects of the treatment.
- DXA equipment is widely available making DXA bone densitometry testing convenient for patients and physicians alike.
- No radiation stays in your body after an x-ray exam.
- X-rays usually have no side effects in the typical diagnostic range for this exam.

Risks

- There is always a slight chance of cancer from excessive exposure to radiation. However, given the small amount of radiation used in medical imaging, the benefit of an accurate diagnosis far outweighs the associated risk.
- Women should always tell their doctor and x-ray technologist if they are pregnant. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) page for more information about pregnancy and x-rays.*
- The radiation dose for this procedure varies. *See the Radiation Dose (https://www.radiologyinfo.org/en/info/safety-xray) page for more information.*
- No complications are expected with the DXA procedure.

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A Word About Minimizing Radiation Exposure

Doctors take special care during x-ray exams to use the lowest radiation dose possible while producing the best images for evaluation. National and international radiology protection organizations continually review and update the technique standards radiology professionals use.

Modern x-ray systems minimize stray (scatter) radiation by using controlled x-ray beams and dose control methods. This ensures that the areas of your body not being imaged receive minimal radiation exposure.

What are the limitations of a bone density scan?

- A DXA test cannot predict who will experience a fracture but can provide a relative risk and it is used to determine whether treatment is required.
- Despite its effectiveness as a method of measuring bone density, DXA 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 DXA devices are more sensitive and better standardized than pDXA 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. These tests are not as helpful in following response to treatment, however, and if they indicate that drug therapy is needed, a baseline central DXA scan should be obtained.
- Follow-up DXA exams should be performed at the same institution and ideally with the same machine. Bone density measurements obtained with different DXA equipment cannot be directly compared.

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