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Osteoporosis & QCT

What you discover now could mean a lot later



Osteoporosis isn't like most diseases. There are often no tell-tale symptoms to indicate that the disease is progressing in its early stages. Even if your bones are becoming weaker, you probably won't feel it. That's why osteoporosis is sometimes called "the silent disease." For most people, the first indication that they have osteoporosis is a fracture. These fractures may cause a loss of height and you may notice your upper back beginning to curve forward. The problem is that by the time a fracture occurs, osteoporosis is already in its advanced stages.

Fortunately, a bone mineral density (BMD) test can determine if you have osteoporosis before you suffer from these symptoms. A Quantitative CT scan or 'QCT' scan is a fast, accurate and safe procedure that measures bone mineral density in the soft trabecular bone of the spine – an area that is first affected by a loss in bone mass but that cannot be independently measured with conventional BMD tests such as DXA. A QCT bone mineral density scan makes it possible to identify and treat the disease early to prevent broken bones later in life.

What is osteoporosis?

Osteoporosis is a disease that causes your bones to break even though you're not doing anything out of the ordinary. These "fragility fractures" happen when the strength of the bone is not enough to withstand pressures from simple tasks, such as picking up a bag of groceries or a grandchild. Or when your wrist or hip breaks, where it would not have broken when you were younger.

While spine, wrist and hip fractures receive the most attention in osteoporosis, many people believe that if you simply fall down and break any bone, then you have or are at risk of having osteoporosis.

How do I know if I have osteoporosis?

If you have broken a bone recently from a minimal trauma, such as falling down or bending over to pick something up, you probably have osteoporosis. If you broke your ankle skydiving, you probably don't have osteoporosis. Not everybody who is at risk of breaking their bones actually do, so it usually takes at least a little fall or injury to break the bone; and some people are more careful than others. However, just because you haven't broken a bone in the last year doesn't mean that it couldn't happen. People with osteoporosis have an increased risk of having a fracture, even if it doesn't happen right away. It might not happen in the next month, or year, or 5 years, but eventually it probably will. One way to identify these people is to measure their bone density.

What is a bone density test ?

A bone density test measures the amount of mineral you have in your bones. The size and mineral density of a bone heavily influences whether or not it will break, so measuring the mineral density of a bone can be used to estimate its risk of breaking. However, there is no need to measure the density of every bone in the body. Osteoporosis is a disease that affects the whole skeleton, some parts more than others but all to some extent, so measuring any one bone helps to estimate your overall risk for fracture. However, the most effective way to tell if you are at risk of a spine fracture is to have a bone density assessment of the spine and similarly, the most effective way to understand your risk of a hip fracture is to get a bone mineral density assessment of the hip. The most common methods for measuring bone mineral density (BMD) at the spine or hip are Dual Energy X-Ray Absorptometry (DXA) and Quantitative CT (QCT).

Can osteoporosis be diagnosed without a bone density test?

If you have a fracture from a simple fall, that is a good indicator that you have osteoporosis. But you don't want to wait until you have a fracture to find out if you might be at risk. There are many factors that increase your risk of having osteoporosis:

- if your mother or grandmother had it;
- if you smoke;
- if you have low body weight; or
- if you had low estrogen levels or low dietary calcium intake earlier in life.

However, a measurement of low bone density is the single most predictive factor for osteoporosis.

If I don't get a mammogram, I could die from breast cancer but I can't die from osteoporosis, can I?

Hip fractures are more common than the combined risk of breast, uterine and cervical cancer, with around 20% of patients dying within a year of fracture. It's not the fall and broken hip that kills, it's the pneumonia after being laid up for months, or the infection after surgery, or the disability that leads to other complications. Osteoporosis is a preventable disease, and if detected early can be treated successfully.

Why are some bone density tests done in the heel or wrist and some at the spine or hip?

Any bone density test can be useful, but the bone measured and the preferred method depends on how the results of the test are going to be used. Because osteoporosis is usually generalized throughout the skeleton, a simple measurement of bone density in the heel or wrist helps to determine if a person has low bone density relative to what they might have had when they were younger. These methods give a better indication of overall skeletal status in women over age 65 than for women early after menopause. Measurements at both the heel and wrist have been shown to predict future fractures but much less so than the predictive value for hip fracture provided by central (spine or hip) bone density measurements such as those provided by QCT.

For younger women, a measurement at the spine is the most sensitive way to determine if they have osteoporosis. Also, because the spine changes fastest with therapy or with low estrogen levels, it is usually the best site to measure for women who are starting therapy, or those who might want to delay taking hormone or other therapy until they see how their bones may be changing. Bone density measurements at the hip are most useful in older women and men who may be at higher risk of hip fracture, because a hip measurement gives the best estimate of the risk for hip fracture in these people.

How accurate are bone density tests in determining if I have osteoporosis?

All approved bone density tests are considered to give some useful information but a measurement of the spine or the hip is considered the most definitive by a number of professional bodies throughout the world. The World Health Organization has also come up with guidelines for defining who has osteoporosis, based on a bone density measurement. These guidelines are one of the best ways we have at this time to determine who may need to be treated for osteoporosis. These guidelines are based on comparing your bone density to the average bone density for young adults, and results are given as a "T-score". The "T-score" is determined by the range of bone density values in young adults.

A T-score of -1.0 or higher is considered "normal" by the WHO guidelines, from -1.0 to -2.5 indicates "osteopenia," and below -2.5 indicates "osteoporosis." It is important to note that these are just guidelines, and that the numbers are intended to be used in the overall evaluation of a patient, and not for a definitive diagnosis, that is, a woman with a T-score of -1.5 who has other risk factors could be considered osteoporotic, while one with a T-score of -2.0 but no other risk factors might not be a candidate for treatment.

If a bone density measurement in my heel gives a T-score value of -1.5, will this be the same for my spine?

Not necessarily. Measurements made in different bones and with different instruments can give T-score values that differ by as much as 1.0 or 2.0 units. Most of the time, T-scores that are low for heel or wrist will also be low for spine or hip, but if the heel or wrist is only slightly low, you can still have osteoporosis in the spine. This is especially true in women soon after menopause, because bone is lost faster from the spine than from the wrist, hip, or heel. Because of these differences, many clinicians feel that if the wrist T-score is between -1.0 and -2.0, it is important to do a follow-up measurement in the spine or hip to confirm the diagnosis of low bone density.

How often should I get a bone density test?

A central bone density test by QCT or DXA is recommended every two years however, the appropriate frequency will depend on a number of factors such as your age, your bone density results and whether you are taking an osteoporosis treatment. Your doctor may wish to extend the time between tests if your risk of fracture is low.

If I am already being treated for osteoporosis or taking therapy, why should I have a bone density test?

In the past, only hormone replacement therapy was available for preventing or treating osteoporosis, but some women do not want to take HRT because of the possible side effects. Over the past decade or so, new therapies have been approved for osteoporosis. Alendronate (Fosamax) was the first of a class of new drugs called 'bisphosphonates' that can be used to prevent or treat osteoporosis. Selective Estrogen Receptor Modulators (SERMs) is another class of drugs, sometimes called "designer estrogens" that can be used, with raloxifene (Evista) being the first of these to be approved. Calcitonin nasal spray is also an approved treatment for osteoporosis. However, it is important to be aware that not everyone responds to these therapies for osteoporosis in the same way, and bone density tests, especially at the spine, are the most accurate way to detect if you are losing bone.

Do bone density tests use x-rays?

Almost all bone density tests use small amounts of x-rays to measure the amount of bone. The exception to this are ultrasound machines that measure bone at the heel or in the leg, but these "peripheral" bone tests are not generally used for diagnosis. The amount of radiation received from a DXA exam is very small and is less than what you would get from a standard chest x-ray, the radiation from a QCT bone density exam is higher than DXA but is much lower than a standard CT scan and is comparable to a set of mammograms.

Do men get osteoporosis?

Yes. While osteoporosis is often considered a "woman's disease," men also get osteoporosis. After age 70, about one-third of hip fractures are in men. Osteoporosis in men may have some different risk factors than in women, but as men live longer the chances of them having a fracture increase just like for women. There is not as much information about bone density and osteoporosis in men as in women, but most experts consider that bone density measurement in men is useful, especially in those over 65 and with other risk factors.

How do we interpret BMD results?

Your QCT bone mineral density (BMD) report is a guide to your current bone health. Although bone mineral density is important in determining whether you may have reduced bone mass and therefore at higher risk of fracture, it should not be viewed in isolation. In evaluating fracture risk, bone density should be considered in conjunction with other clinical risk factors for fracture. Important independent risk factors include:

- age;
- low body weight;
- history of postmenopausal fracture;
- family history of fracture; and
- poor neuromuscular function.

Intervention should be based on fracture risk as determined by a combined assessment of BMD, age and other clinical risk factors for fracture. Any treatment decisions should be based on fracture risk.

What does a QCT spine BMD report tell me?

Your QCT spine report will show bone mineral density results for two or more vertebrae in your lower (lumbar) spine between T11 and L4 and an average of those results. The T-Score is a comparison of your BMD results with the average for a person between 20 and 39 years old, the peak bone density years. The Z-Score is a comparison of your BMD results the average for a person of your age. If you have had a previous QCT exam, a comparison table will also show any changes since your previous exams.

BMD measurement by QCT is made in the more metabolically-active trabecular bone only and so is often more sensitive to change than DXA measurement. For this reason, QCT BMD measurements do not give the same T-Scores and Z-Scores as DXA. For diagnostic classification, BMD measured by QCT is compared to actual bone mineral density values according to guidelines published by the American College of Radiology:

- Spine BMD values above 120 mg/cm³ are good, this is normal bone mineral density.
- Values between 80 and 120 mg/cm³ indicate Osteopenia (thin bones).
- Less than 80 mg/cm³ indicates Osteoporosis (porous bones).

What does a QCT hip BMD report tell me?

Your QCT hip report shows which hip was analyzed and bone mineral density results for three parts of the hip bone (neck, trochanter and intertrochanter) and the result for the total of these. The T-Score is a comparison of your BMD results with the average for a young normal person between 20 and 39 years old, the peak bone density years. The Z-Score is a comparison of your BMD results the average for a person of your age. At the hip, QCT T-Scores are equivalent to DXA T-Score and they are evaluated using the World Health Organization (WHO) classifications in the same way:

- Scores between +1 and - 1 are good and show normal bone mineral density.
- Scores between -1 and -2.5 indicate Osteopenia (thin bones).
- Less than -2.5 indicate Osteoporosis (porous bones).

If you have had a previous QCT exam, a comparison table will also show any changes since your previous exams.

Summary

Osteoporosis is a treatable and preventable but often progresses without obvious symptoms. Early diagnosis and intervention greatly improves the outlook for patients and bone density measurement is an important part of early detection and diagnosis of this disease.

About MindwaysCT

MindwaysCT has been at the forefront of technical innovation in QCT since its invention in the late 1970's. Today, modern QCT technology is the most effective solution for bone densitometry measurement. MindwaysCT premier product, QCT Pro™, offers both 3D volumetric analysis of BMD in the spine and DXA-equivalent T-scores measurement at the hip. Spine BMD exclusively measures the more metabolically active trabecular to provide exceptional sensitivity for the early detection of changes in bone density. This true volumetric QCT analysis gives patients with obesity, scoliosis, degenerative spinal diseases and arthritis a way to access accurate BMD analysis.

At the hip, QCT Pro™ produces the hip T-Scores outlined by the World Health Organization classification of osteoporosis and in the FRAX® fracture risk tool. QCT also does not require an uncomfortable rotation of the hip during imaging because this can be done in software. In addition to producing quality medical devices that are used all over the world, MindwaysCT offers both academic and commercial research with new tools to explore clinical problems associated with osteoporosis, orthopedics and osteoarthritis.

The scientists at MindwaysCT are committed to providing world-class technologies that enable the accurate determination of tissue densities, structures and types through new and innovative application of quantitative CT.

For more information about QCT or to find out where you can get a QCT test, please visit www.qct.com or call the toll-free number 877-MINDWAYS.



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