

A Discussion of Osteoporosis

What is Osteoporosis?

Osteoporosis is a bone disease in which bones become thinner, softer, and more porous (“spongelike”) due to a loss of the minerals stored in the bones. Osteoporosis is usually painless until a bone breaks or fractures. Bone fractures and height loss are all too often consequences of osteoporosis.

Osteoporosis is defined as ~ 25% bone loss compared to a healthy young adult or, on a bone density test, 2.5 standard deviations below normal. Although all adults experience some bone loss with age, few realize that stooped posture and loss of height [greater than 1-2 inches] is actually caused by vertebral fractures due to osteoporosis.

Osteoporosis is a major public health threat for more than 28 million Americans. In the US today, 10 million individuals already have the disease and 18 million more have low bone mass, placing them at increased risk. Ten percent of African-American women over age 50 have osteoporosis and an additional 30% have low bone density that puts them at increased risk of developing osteoporosis. Significant risk has been reported in people of all ethnic backgrounds.

Each year, osteoporosis costs the US nearly \$14 billion and is responsible for 1.5 million fractures including:

- ✓ 300,000 hip fractures
- ✓ 700,000 vertebral fractures
- ✓ 250,000 wrist fractures, and
- ✓ 300,000 fractures at other sites

Seventy-one percent of women with osteoporosis have not had diagnostic testing and are unaware of their condition, leaving them at increased risk for fractures. Osteoporosis is considered by many to be a national health priority – one in two women and one in eight men over age 50 will have an osteoporotic fracture in their lifetime. Fractures due to osteoporosis can lead to chronic pain, loss of independence and, in the case of hip fracture, can be life-threatening. One of every five persons who have a hip fracture will not survive more than one year. In people age 65 and older, 90% of hip fractures in women and 80% of those in men can be attributed to osteoporosis.

Multiple vertebral fractures can result in collapsed vertebrae, stooped posture, loss of height, chronic pain, disability, loss of independence, and can cause compression of the lungs and stomach. This compression can lead to difficulty in breathing and even loss of appetite. Despite the general public awareness of osteoporosis in general, very few people make the connection between osteoporosis and fracture risk.

What Causes Osteoporosis

The cause of osteoporosis is not known. However, a loss of estrogen due to menopause is the risk factor most commonly associated with osteoporosis. Osteoporosis is most common in older women, affecting about 25% of those over age 60. Women who experience early or premature menopause before the age of 45 are at further increased risk. Aging is another risk factor for osteoporosis. Without medical treatment, men and women lose 1%-3% of their bone mass each year after age 50.

Risk factors for osteoporosis and individuals who may benefit from screening include:

- Being female
- Thin and/or small frame
- Advanced age
- A family history of osteoporosis
- Post menopause, including early or surgically induced menopause [women can lose up to 20% of their bone mass in the 5-7 year following menopause]
- Abnormal absence of menstrual periods [amenorrhea]
- Anorexia nervosa or bulimia
- Small body frame or adult weight of less than 127 pounds
- A diet low in calcium or inadequate Vitamin D
- High caffeine intake
- Use of certain medications such as steroids (such as prednisone) and anticonvulsants
- Low testosterone levels in men
- An inactive lifestyle
- Cigarette smoking
- Excessive use of alcohol
- Certain hormonal disorder such as hyperthyroidism (too high thyroid hormone), hyperparathyroidism (too high parathyroid hormone), or Cushing's Disease (excess production of steroid hormones by the body).
- Disorders such as chronic liver disease or intestinal disorders such as malabsorption, which interferes with calcium absorption
- Being Caucasian or Asian, although African Americans and Hispanic Americans are at significant risk as well

Do Men Get Osteoporosis

More than 2 million American men have been found to have the thinning bones and skeletal weakness of osteoporosis. Additionally, 3 million men are now at increased risk and likely don't know it.

It is true that osteoporosis strikes more women than men –about 4-6 times more often. It's also true that men's bones tend to grow larger, stronger and denser than women. Men, which tend to be more physically competitive than their female counterparts have an additional benefit, as physical activity is one of the more important ways to increase bone density and protect bone health. However, even the most active men cannot ignore the facts of life. Bone mass in men tends to reach its peak around age 30 and then gradually decrease with advancing age. Women

ultimately give up between 30-50% of bone mass as they age where for men it is closer to 20-30%. However, this does not limit men having, through bone loss, back pains and bone fractures. In fact, this year alone about 500,000 American men will suffer osteoporosis-related breaks, mostly in the spine, hip and wrist. These fractures are not only limiting for physical activity, but thousands die each year from fracture-related complications.

Does Back Pain Mean I Have Osteoporosis

No, having back pain does not necessarily mean you have osteoporosis. The most common causes of back pain are muscle strain and other conditions such as arthritis or the more common “osteo-arthritis”. However, back pain can be due to osteoporosis-related fracture.

What Can I Do to Prevent Osteoporosis

Osteoporosis is not inevitable and is highly preventable. There are effective measures you can take to maintain strong bones and prevent osteoporosis. Of all the side effects of aging, osteoporosis is one of the more preventable through diet, exercise, changes in lifestyle, and early diagnosis.

The two key nutrients for bone health are calcium, which makes bones stronger, and vitamin D, which helps the body absorb the calcium. Men between the ages of 25 and 65 should consume a minimum of 1000 mg of calcium a day; after age 65, this should be increased to 1500 mg per day. There are plenty of sources for calcium in the diet including dairy products. Green vegetables such as broccoli, spinach, or kale provide 90-120 mg of calcium in a 1-cup serving when steamed. A quart of milk contains a full day’s supply of calcium and a large amount of vitamin D [however, realize that dairy products also contains butterfat that may have ultimate effects on your cholesterol and waistline; thus using “skim” milk is preferred and contains as much calcium as whole milk]. Dietary supplements for both are widely available and inexpensive. For osteoporosis prevention vitamin D should be consumed in doses of 400-800 IU/day.

Exercise is an important activity. The emphasis should be on weight-bearing activities [walking, jogging, racquet sports] in which bones and muscles work against gravity. Lifting weights and using resistance machines can help preserve bone density. Although swimming is an excellent form of exercise, it is not considered to be “weight bearing” so it is less beneficial to your bones.

Tobacco, alcohol and caffeine use increases your risk of osteoporosis. Do not begin smoking cigarettes and if smoking then quit. Limit alcohol intake to 1-2 alcoholic drinks per day. Limit caffeine intake to no more than three cups of caffeine-containing beverages a day. Look at your medicines to be sure that they are not harmful to your bone health. Prolonged use of steroids [given for asthma, arthritis, allergies], anticonvulsants [seizure medication] or aluminum-based antacids, can weaken your bones.

How is Osteoporosis Diagnosed

Standard x-rays used to identify a break in a bone cannot detect osteoporosis until 25-40% of bone mass has been lost and there are no early “warning signs” on an otherwise normal X-ray;

thus X-rays are inadequate and inappropriate for diagnostic screening for osteoporosis. There are basically only two x-ray techniques that have been shown to provide appropriate clinical information regarding bone density: dual-energy x-ray absorptiometry {DXA – or more common called “dexa”}, and three-dimensional QCT {quantitative computed tomography}. A heel-bone ultrasound measurement may be used to screen for osteoporosis, but it is not considered an effective way to follow your response to treatment. When done repeatedly over a period of time, true bone density tests can show the rate of bone mineral loss in those not receiving adequate therapy, or the rate of bone mineral gain in those with adequate prevention and proper treatment for osteoporosis.

Both DXA and QCT are well established. DXA is a two-dimensional projection x-ray technique and is used clinically to measure the spine, hand, hip, and proximal femur (the long leg bone). 3D-QCT uses a complete or “volume” data set to obtain bone mineral density of the spine, hip or of the proximal femur in three dimensions. QCT has been available for many years, but due to equipment expense, was available generally in association only with a major medical center and done only by radiologists. DXA equipment has undergone a number of changes, but is commonly now found in the community, often under the control of internists or endocrinologists. The fundamental limitations of both for use in individual patients have been adequate quality control, not only the images, but also in the method of interpretation. Thus research grade precision is essential not only for initial examinations, but to quantitatively monitor bone mineralization on repeat testing, to determine the effects of therapy.

Spinal bone tissue as assessed by QCT measures has been shown to change about 2-3 times as fast as can be measured adequately by DXA, so that for the same precision QCT should show changes in about one-third to one-half the time; this adds value to repeat testing. In addition, DXA, because it is a projection method rather than a tomographic method, can result in an overestimation of spine and hipbone mineral density in obese women, due to excess soft tissue adiposity. Finally, DXA estimates for the spine can be influenced if there are substantial degenerative changes in the same region, falsely elevating the bone mineral measurement. QCT, since it examines the interior of the bones, does not have this limitation.

A prediction of fracture risk in women under the age of 65 [where vertebral fractures dominant hip fractures] is best achieved by bone mineralization estimates of the spine and compared to densities from a standardized and precisely validated bone mineral phantom included in the imaging field [DXA] or scanning circle [QCT]. For women over the age of 65, measures at the hip and/or the spine are felt to be clinically useful; however, standard views using DXA of the spine are not considered to be sufficient, due again to the issue of concomitant degenerative joint disease in this age group.

What Treatments are Available for Osteoporosis

Although there is no cure for osteoporosis, there are several treatments available. Several types of medication may prevent further bone mineral loss, and some of these can increase bone density by up to 5-10%, which can reduce the risk of fracture. Currently, all approved osteoporosis medications are known as “antiresorptive” agents because they stop resorption (or depletion) of minerals from bones.

Medications include the following. Estrogen supplementation is considered an effective way to stabilize or increase bone density and prevent fractures. However, recent evidence in women taking estrogens long term to prevent “hot flashes” has resulted in a potential increased risk for a heart attack, increased risk of breast cancer, and increased risk of blood clotting. Decisions to use estrogen therapy must then be weighted against potential harm and should be thoroughly discussed between the patient and their physician. Bisphosphonates are effective at increasing bone density and reducing fractures. Fosamax (alendronate) and Actonel (risedronate) are the only two bisphosphonates that have been cleared by the FDA for treatment/prevention of osteoporosis in men and women. Unlike estrogen, bisphosphonates are not hormones. They do not prevent hot flashes, or reduce the risk of heart attack or stroke in those without known heart disease. Bisphosphonates may cause nausea, esophageal or stomach irritation, or abdominal pain. Raloxifene (Evista) is the first of a new class of osteoporosis medications called selective estrogen receptor modulators (SERMS). This medicine does not prevent bone loss and fractures as well as estrogen or the bisphosphonates, but like estrogen, it lowers cholesterol and may prevent heart disease. Unlike estrogen, it may prevent breast cancer and does not cause postmenopausal bleeding or spotting in women. Evista may cause hot flashes, and like estrogen, slightly increases the risk of blood clot formation; thus it is NOT to be used in women with a prior history of blood clots. Calcitonin is a hormone that helps prevent bone loss. It is typically given daily as a nasal spray; less commonly it is given by injection. Side effects include nasal irritation from the nasal spray, and nausea and local irritation of the skin if injected. Calcitonin may not prevent hip fractures, but has been shown to prevent fractures of spinal bone. A form of human parathyroid hormone may soon be available to build bone rapidly to reduce the risk of fractures, but it will likely be given by injection. Some physicians may also prescribe testosterone supplements for patients with low testosterone levels.

Conclusions

Osteoporosis impacts the lives of many people, especially older women. While certain factors increase the risk of developing the disease, steps can be taken to reduce an individual’s risk and help control the disease. Exercise, adequate calcium intake, good nutrition and regular physical exercise play important roles in the prevention of osteoporosis. The best time to fight osteoporosis, whether you are a man or a woman, is early in life when you can be most effective in heading it off. The key is early awareness of the risk and then early diagnosis. If drug therapy is needed, then this is best determined in consultation with a physician.



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Bibliography: National Institutes of Health Consensus Development Conference Statement: Osteoporosis Prevention, Diagnosis, and Therapy. 2000