Chronic Disease Prevention Bulletin

May 2005

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Osteoporosis Awareness and Prevention Month

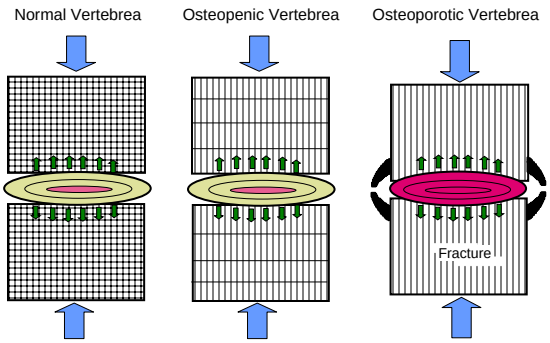
What is Osteoporosis?

Osteoporosis is a condition in which bones become fragile due to loss of calcium. If not prevented or if left untreated, osteoporosis can progress painlessly until a bone breaks. These broken bones occur typically in the hip, spine, and wrist. Any bone, however, can be affected, but of special concern are fractures of the hip and spine due to their supportive nature. A hip fracture almost always requires hospitalization and major surgery. It can impair a person's ability to walk unassisted and may cause prolonged or permanent disability or even death. Spinal or vertebral fractures also have serious consequences, including loss of height, severe back pain, and deformity.

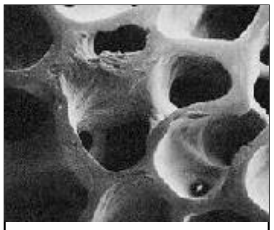
Millions of Americans are at risk. While women are four times more likely than men to develop the disease, men also can suffer from osteoporosis.

How does osteoporosis develop?

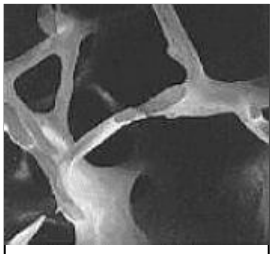
As the figures below demonstrate, under normal conditions osteocytes (osteoblast and osteoclast) work synergistically to assure the proper balance of bone calcium and thus assuring the necessary strength of bone is maintained. This is seen as a "normal" trabecular (weaved) pattern.



As the need for bone declines (atrophy) or the calcium level in the blood drops significantly, the osteoclasts begin breaking down bone to raise the blood calcium to required levels. The pattern of bone breakdown is predictable in that it will follow Wolfe's Law, which basically states that the body will cease unnecessary functions or rid itself of less important material in order to maintain the most critical of functions or structure necessary for life. This can be seen in the second picture where the calcium within the bone is pulled to support the need for the critical balance of blood calcium levels, leading to loss of the horizontal trabecula. The body will retain the vertical trabecula (pillars) in order to assure the "relative" strength of the bone along the stress points, while achieving the necessary blood calcium levels required for other more vital functions. This early phase of bone loss is called osteopenia.



Normal (Healthy) Bone



Unhealthy Bone

Eventually, with continued demands for more calcium to support vital life functions and without adequate external supply through a nutritious diet, all of the horizontal trabecula will be lost, leaving a minimal amount of pillars to support the required structure. Notice that if the body is forced to constantly pull calcium from the vertebrae for maintenance of blood calcium levels, the disc material will often envelop into the vertebra and there will be an increase in the incidence of fractures. Only after there are significant external signs such as the development of a Dowager's hump (an abnormal outward curvature of the vertebrae of upper back) or other fractures will many patients become aware that there are problems and seek medical attention. This is the final stage of osteoporosis development.

Unfortunately, a significant amount of bone loss must exist before traditional x-ray will revel the need for intervention; there must be at least a 30% decrease in bone material (calcium) before the change will show up on traditional X-rays. This means that many individuals with the early signs of osteopenia will go undetected and untreated, most likely advancing to osteoporosis. It is important, therefore, to receive appropriate testing, such as bone densitometry, to assure that the bone density is intact, especially in the elderly and those with elevated risk factors.

Risk Factors for Osteoporosis

- Age
- Gender
- Family History and Personal History of Fractures as an Adult
- Race
- Bone Structure and Body Weight
- Menopause/Menstrual History
- Lifestyle
- Medications/Chronic Diseases

What can you do to reduce your risks for developing osteoporosis?

The best treatment for osteoporosis is prevention. There are four key steps necessary to prevent osteoporosis. While no one step alone is enough to prevent osteoporosis, all four in combination may significantly reduce your risks for developing osteopenia and ultimately progressing to osteoporosis.
They are:

- A balanced diet rich in calcium and vitamin D;
- Weight-bearing exercise;
- A healthy lifestyle with no smoking or excessive alcohol intake; and
- Bone density testing and medical intervention when appropriate.

It should be remembered that preventing osteoporosis is a lifelong activity. Exercise and calcium intake during childhood and the years after puberty until age 35 are most critical in achieving the maximum amount of bone density for an individual. By about age 20, the average woman has acquired 98 percent of her skeletal mass (and reserves of calcium). If a deficit is established prior to adulthood, she will develop osteopenia. Sadly, most American women are seriously deficient in calcium intake. The average intake is around 550 milligrams a day, whereas 1,000 to 1,500 milligrams are needed to maintain and develop proper bone mass. If less calcium is ingested than is needed by the body for muscular contraction and other activities, it will be drawn from the bones.

The body absorbs calcium, like other minerals, rather selectively. It appears that calcium is best absorbed from food sources rather than from the widely advertised tablets. Children and teenagers need 1,200 to 1,500 milligrams of calcium a day, menstruating women need 1,000 milligrams a day, and non-menstruating women need 1,500 milligrams a day just to remain in "neutral calcium balance."

What is the best way to get your daily supply of calcium?

According to Carol L. Otis, M.D, author of *Avoiding A Diagnosis Of Osteoporosis*, try to meet your calcium requirement from food sources. At the end of a day, add up how well you have done. If your calcium intake was marginal or low, then consider taking a supplement before going to bed, taking no other supplements or medicines that would compete with the calcium.

As a rough rule of thumb, an eight-ounce glass of milk or two ounces of hard cheese will provide 300 milligrams, a cup of yogurt provides 400 milligrams, three and a half ounces of tofu gives you 150, three ounces of canned salmon has 150, three ounces of sardines with bones has 372, and a half cup of broccoli provides 136 milligrams.

Vitamin D is also important as an essential aid in calcium absorption. The ADA for vitamin D is 400 I.U. (international units), but the requirement is increased as you get older. It is probably safe to take up to 600 to 800 I.U. a day. Most of us get adequate vitamin D in our food or from exposure to the sun and do not require a supplement, however.

Regular exercise throughout a lifetime is also important to help build bone density. In general, weight-bearing exercises and strength training are the best for bone building. Activities should be done for 20 to 30 minutes several times a week. Other exercises such as sit-ups, bent-knee pushups, back extensions, and posture training can help the spine and hips, the areas most vulnerable to fractures.

Your risk of developing osteoporosis also increases if there is a history of the disease in your family, if you are a smoker, drink alcohol (more than two drinks a day), have amenorrhea, are Caucasian, or are a fair-skinned individual. While African-American and Latino/Hispanic women have a lower incidence of osteoporosis, they still need to get their daily calcium.

References:
Sports Doctor, Inc. (2000): Avoiding A Diagnosis Of Osteoporosis (www.sportsdoctor.com)

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