

OSTEOPOROSIS OVERVIEW

by The Osteoporosis and Related Bone Diseases National Resource Center (USA)

Osteoporosis, or porous bone, is a disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased susceptibility to fractures of the hip, spine and wrist. Men as well as women suffer from osteoporosis, a disease that can be prevented and treated.

What is Bone?

Bone is living, growing tissue. It is made mostly of collagen, a protein that provides a soft framework, and calcium phosphate, a mineral that adds strength and hardens the framework. This combination of collagen and calcium makes bone strong yet flexible to withstand stress. More than 99% of the body's calcium is contained in the bones and teeth. The remaining 1% is found in the blood.

Throughout your lifetime, old bone is removed (resorption) and new bone is added to the skeleton (formation). During childhood and teenage years, new bone is added faster than old bone is restored. As a result, bones become larger, heavier and denser. Bone formation continues at a pace faster than resorption until peak bone mass (maximum bone density and strength) is reached during the mid-20s. After age 30, bone resorption slowly begins to exceed bone formation. Bone loss is most rapid in the first few years after menopause but persists into the postmenopausal years. Osteoporosis develops when bone resorption occurs too quickly or if replacement occurs too slowly. Osteoporosis is more likely to develop if you did not reach optimal bone mass during your bone building years.

Risk Factors

Certain factors are linked to the development of osteoporosis or contribute to an individual's likelihood of developing the disease. These are called "risk factors." Many people with osteoporosis have several of these risk factors, but others who develop osteoporosis have no identified risk factors. There are some risk factors that you cannot change, and others that you can.

Risk factors you cannot change:

- **Gender** - Your chances of developing osteoporosis are greater if you are a woman. Women have less bone tissue and lose bone more rapidly than men because of the changes involved in menopause.
- **Age** - The older you are, the greater your risk of osteoporosis. Your bones become less dense and weaker as you age.
- **Body size** - Small, thin-boned women are at greater risk.
- **Ethnicity** - Caucasian and Asian women are at highest risk. African-American and Hispanic women have a lower but significant risk.
- **Family history** - Susceptibility to fracture may be, in part, hereditary. People whose parents have a history of fractures also seem to have reduced bone mass and may be at risk for fractures.

Risk factors you can change:

- **Sex hormones:** abnormal absence of menstrual periods (amenorrhea), low estrogen level (menopause), and low testosterone level in men.
- **Anorexia.**
- **A lifetime diet low in calcium and vitamin D.**
- **Use of certain medications,** such as glucocorticoids' or some anticonvulsants.

- *An inactive lifestyle* or extended bed rest.
- *Cigarette smoking.*
- *Excessive use of alcohol.*

Prevention

To reach optimal peak bone mass and continue building new bone tissue as you get older, there are several factors you should consider:

Calcium - An inadequate supply of calcium over the lifetime is thought to play a significant role in contributing to the development of osteoporosis. Many published studies show that low calcium intakes appear to be associated with low bone mass, rapid bone loss, and high fracture rates. National nutrition surveys have shown that many people consume less than half the amount of calcium recommended to build and maintain healthy bones. Good sources of calcium include low fat dairy products, such as milk, yoghurt, cheese and ice cream; dark green, leafy vegetables, such as broccoli, collard greens, bok choy and spinach; sardines and salmon with bones; tofu; almonds; and foods fortified with calcium, such as orange juice, cereals and breads. Depending upon how much calcium you get each day from food, you may need to take a calcium supplement.

Calcium needs change during one's lifetime. The body's demand for calcium is greater during childhood and adolescence when the skeleton is growing rapidly, and during pregnancy and breast feeding. Postmenopausal women and older men also need to consume more calcium. This may be caused by inadequate amounts of Vitamin D, which is necessary for intestinal absorption of calcium. Also, as you age, your body becomes less efficient at absorbing calcium and other nutrients. Older adults also are more likely to have chronic medical problems and to use medications that may impair calcium absorption.

Vitamin D. Vitamin D plays an important role in calcium absorption and in bone health. It is synthesized in the skin through exposure to sunlight. While many people are able to obtain enough Vitamin D naturally, studies show that Vitamin D production decreased in the elderly, in people who are house-bound, and during the winter. These individuals may require Vitamin D supplementation to insure a daily intake of between 400 to 800 IU of Vitamin D. Massive doses are not recommended.

Exercise. Like muscle, bone is living tissue that responds to exercise by becoming stronger. The best exercise for your bones is weight-bearing exercise, that forces you to work against gravity. These exercises include walking, hiking, jogging, stair-climbing, weight training, tennis and dancing.

Smoking. Smoking is bad for your bones as well as for your heart and lungs. Women who smoke have lower levels of estrogen compared to non-smokers and frequently go through menopause earlier. Postmenopausal women who smoke may require higher doses of hormone replacement therapy and may have more side effects. Smokers also may absorb less calcium from their diets.

Alcohol. Regular consumption of 2 to 3 ounces a day of alcohol may be damaging to the skeleton, even in young women and men. Those who drink heavily are more prone to bone loss and fractures, both because of poor nutrition as well as increased risk of falling.

Medications that cause bone loss. The long-term use of glucocorticoids (medications prescribed for a wide range of diseases, including Addison's, arthritis, asthma, Crohn's, lupus and other diseases of the lungs, kidneys and liver) can lead to a loss of bone density and fractures'. Other forms of drug therapy that can cause bone loss include long-term treatment with certain anti-seizure drugs, such as phenytoin (Dilantin), barbiturates, and valproate (Depakote); gonadotropin releasing hormone (GnRH) analogs used to treat endometriosis; excessive use of aluminium-containing antacids; certain cancer treatments; and excessive thyroid hormone; It is important to discuss the use of these drugs with your physician, and not to stop or alter your medication dose on your own.

Symptoms

Osteoporosis is often called the "silent disease" because bone loss occurs without symptoms. People may not know that they have osteoporosis until their bones become so weak that a sudden strain, bump, or fall causes a hip fracture or a vertebra to collapse. Collapsed vertebrae may initially be felt or seen in the form of severe back pain, loss of height, or spinal deformities such as kyphosis, or severely stooped posture.

Detection

Following a comprehensive medical assessment, your doctor may recommend that you have your bone mass measured. Bone mineral density (BMD) tests measure bone density in the spine, wrist, and/or hip (the most common sites of fractures due to osteoporosis), while others measure bone in the heel or hand. These tests are painless, non-invasive, and safe. Bone density tests can:

- Detect low bone density before a fracture occurs.
- Confirm a diagnosis of osteoporosis if you have already fractured,
- Predict your chances of fracturing in the future.
- Determine your rate of bone loss and/or monitor the effects of treatment if the test is conducted at intervals of a year or more.

To find the location of a bone density testing centre near you, call the National Osteoporosis Foundation at 1-800-464-6700 (In the USA only).

Treatment

A comprehensive osteoporosis treatment program includes a focus on proper nutrition, exercise, and safety issues to prevent falls that may result in fractures. In addition, your physician may prescribe a medication to slow or stop bone loss, increase bone density, and reduce fracture risk.

- **Nutrition:** The foods we eat contain a variety of vitamins, minerals, and other important nutrients that help keep our bodies healthy. All of these nutrients are needed in a balanced proportion. In particular, calcium and vitamin D are needed for strong bones as well as for your heart, muscles, and nerves to function properly.
- **Exercise:** Exercise is an important component of an osteoporosis prevention and treatment program. Exercise not only improves your bone health, but it increases muscle strength, coordination, and balance and leads to better overall health. While exercise is good for someone with osteoporosis, it should not put any sudden or excessive strain on your bones. As extra insurance against fractures, your doctor can recommend specific exercises to strengthen your back.

Therapeutic Medications:

Currently, estrogen, calcitonin, and alendronate are approved by the U. S. Food and Drug Administration (FDA) for the treatment of post-menopausal osteoporosis. Estrogen, raloxifene and alendronate are approved for the prevention of the disease.

- **Estrogen** - Estrogen replacement therapy (ERT) has been shown to reduce bone loss, increase bone density in both the spine and hip, and reduce the risk of hip and spinal fractures in postmenopausal women. ERT is administered most commonly in the form of a pill or skin patch and is effective even when started after age 70. When estrogen is taken alone, it can increase a woman's risk of developing cancer of the uterine lining (endometrial cancer). To eliminate this risk, physicians prescribe the hormone progestin in combination with estrogen (hormone replacement therapy or HRT) for those women who have not had a hysterectomy. ERT/HRT relieves menopause symptoms and has been shown to have beneficial effects on both the skeleton and heart. Experts recommend ERT for women at high risk for osteoporosis. ERT is approved for both the

prevention and treatment of osteoporosis. ERT is especially recommended for women whose ovaries were removed before age 50. Estrogen replacement should also be considered by women who have experienced natural menopause and have multiple osteoporosis risk factors, such as early menopause, family history of osteoporosis, or below-normal bone mass for their age. As with all drugs, the decision to use estrogen should be made after discussing the benefits and risks and your own situation with your doctor.

- **Raloxifene** - Raloxifene (brand name Evista) is a drug that was recently approved for the prevention of osteoporosis. It is from a new class of drugs called Selective Estrogen Receptor Modulators (SERMs) that appear to prevent bone loss at the spine, hip and total body. Raloxifene's effect on the spine does not appear to be as powerful as either estrogen replacement therapy or alendronate, but its effect on the hip and total body are more comparable. While side effects are not common with Raloxifene, those reported include hot flashes and deep vein thrombosis, the latter of which is also associated with estrogen therapy. Additional research studies on Raloxifene will be ongoing for several more years.
- **Alendronate** - Alendronate (brand name Fosamax) is a medication from the class of drugs called bisphosphonates. Like estrogen, alendronate is approved for both the prevention and treatment of osteoporosis. In post-menopausal women with osteoporosis, the bisphosphonate alendronate reduces bone loss, increases bone density in both the spine and hip, and reduces the risk of both spine fractures and hip fractures. Side effects from alendronate are uncommon, but may include abdominal or musculoskeletal pain, nausea, heartburn, or irritation of the oesophagus. The medication should be taken on an empty stomach and with a full glass of water first thing in the morning. After taking alendronate, it is important to wait in an upright position for at least one half hour, or preferably one hour, before the first food, beverage, or medication of the day.
- **Calcitonin** - Calcitonin is a naturally occurring non-sex hormone involved in calcium regulation and bone metabolism. In women who are at least five years beyond menopause, calcitonin slows bone loss, increases spinal bone density and, according to anecdotal reports, relieves the pain associated with bone fractures. Calcitonin reduces the risk of spinal fractures and may reduce hip fracture risk as well. Studies on fracture reduction are ongoing. Calcitonin is currently available as an injection or nasal spray. While it does not affect other organs or systems in the body, injectable calcitonin may cause an allergic reaction and unpleasant side effects including flushing of the face and hands, urinary frequency, nausea, and skin rash. The only side effect reported with nasal calcitonin is a runny nose.

Fall Prevention

Fall prevention is a special concern for men and women with osteoporosis. Falls can increase the likelihood

of fracturing a bone in the hip, wrist, spine or other part of the skeleton. In addition to the environmental factors listed below, falls can also be caused by impaired vision and/or balance, chronic diseases that impair mental or physical functioning, and certain medications, such as sedatives and antidepressants. It is important that individuals with osteoporosis be aware of any physical changes they may be experiencing that affect their balance or gait, and that they discuss these changes with their health care provider.

Some tips to help eliminate the environmental factors that lead to falls include:

- **Outdoors** - Use a cane or walker for added stability; wear rubber-soled shoes for traction; walk on grass when sidewalks are slippery; in winter, carry salt or kitty litter to sprinkle on slippery sidewalks; be careful on highly polished floors that become slick and dangerous when wet. Use plastic or carpet runners when possible.

- **Indoors** - Keep rooms free of clutter, especially floors; keep floor surfaces smooth but not slippery; wear supportive, low-heeled shoes even at home; avoid walking in socks, stockings, or slippers; be sure carpets and area rugs have skid-proof backing or are tacked to the floor; be sure stairwells are well lit and that stairs have handrails on both sides; install grab bars on bathroom walls near tub, shower, and toilet; use a rubber bath mat in shower or tub; keep a flashlight with fresh batteries beside your bed; if using a step-stool for hard-to-reach areas, use a sturdy one with a handrail and wide steps; add ceiling fixtures to rooms lit by lamps. Consider purchasing a cordless phone so that you don't have to rush to answer the phone when it rings or you can call for help if you do fall.

Addison's Disease sufferers who rely on glucocorticoids as replacement therapy must bear in mind that their levels of replacement hormone are minimal, mimicking the missing but natural levels of steroids, and should not cause significant increases in bone loss. Since cortisone replacement in Addison's disease is prescribed to simulate the body's normal physiologic production, it is unlikely that the person who is being closely monitored would be exposed to excessive doses, which can cause osteoporosis. But some Addisonians have experienced osteoporosis. Therefore, calcium supplements and periodic bone density testing may be considered as a hedge against bone loss from a variety of factors. The National Osteoporosis Foundation (NOF) welcomes calls to locate a bone-density testing location in your area (USA only). They also offer educational pamphlets on products or programs for people with osteoporosis.

The Osteoporosis and Related Bone Diseases National Resource Center seeks to create an awareness of osteoporosis, Paget's disease and *osteogenesis imperfecta*, and of the general possibilities for therapy. Remedial action in each individual case should be determined with professional medical advice directed toward the individual's particular circumstances and condition.

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