Patient Information on Calcium, Vitamin D and Osteoporosis

What Is Osteoporosis?
Bone is a living tissue, and it is constantly changing. Old bone is removed, often called “resorption,” while new bone is being formed. After age 30, the resorption of old bone happens faster than the formation of new bone. If lost bone cannot be replaced fast enough, then osteoporosis can develop.

Am I At Risk For Osteoporosis?
Some factors that put people at a higher risk for developing osteoporosis include age, being female or fair-skinned, having a small body frame, and having a family history of fractures. Some risk factors are easy to change once you are aware of them. Some of these include having the right amounts of sex hormones (estrogen for women and testosterone for men), being physically active, not smoking, and avoiding the use of alcohol and caffeine. Once you have reached middle adulthood, the trick is to slow the loss of bone as much as possible by changing the risk factors you can.

How Important Is Calcium?
One of the most important ways to prevent osteoporosis is to get enough calcium and vitamin D. Most of the body’s calcium is stored in the bone. If the body doesn’t get enough calcium each day, it compensates by taking calcium from the bone to use in the blood. So, it is very important to get enough calcium every day, preferably from food. Foods which are good sources of calcium include low-fat dairy products such as milk, yogurt, cheese, and ice cream; dark green leafy vegetables such as broccoli, spinach, and bok choy; and calcium-fortified foods such as cereals and orange juice. One cup of plain yogurt has 415 mg of calcium, one cup of skim milk has 300 mg of calcium, one ounce of Swiss cheese has 270 mg calcium, and one ounce of cheddar cheese has 205 mg calcium. Broccoli has 80 mg calcium per cup and turnip greens have 100 mg calcium per 1/2 cup. Other foods rich in calcium include tofu, almonds, dried figs, and sardines. If you cannot get enough calcium from the foods you eat, then taking a calcium supplement is a good idea. Supplements are best absorbed when taken with food. Space out the intake of calcium throughout the day since only 500 mg can be absorbed at one time. It’s recommended that adults over 50 years of age get 1200 mg to 1500 mg of calcium from foods and supplements each day.

What About Vitamin D?
Vitamin D is produced in the skin when exposed to sunlight. It is essential for the absorption of calcium. As people age, there is a decrease in the production of vitamin D. There is also less vitamin D production in people who do not get much sunlight, by spending most of their time indoors. A vitamin D supplement is probably not necessary if you get at least 10 to 15 minutes of sunlight each day. If not, then you may consider a supplement that provides 400 IU to 800 IU of vitamin D each day.

Are There Treatments for Osteoporosis?
Some medications used to treat osteoporosis include estrogens, Fosamax, Actonel, or Evista and Miacalcin. It is very important to continue to get adequate amounts of calcium and vitamin D through diet or supplements, even if you are taking prescription medication. These medications work best if there is enough calcium and vitamin D in your system.

Information Sources
A few good Internet Web sites with information on calcium and osteoporosis include www.calciuminfo.com, the National Institutes of Health at www.osteo.org/osteo.html, and the National Osteoporosis Foundation at www.nof.org/prevention/prevention.htm.
Calcium, Vitamin D, and Osteoporosis

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Introduction

The statistics on osteoporosis are surprising. Ten million Americans are currently diagnosed with osteoporosis. An additional 18 million Americans have reduced bone mass, which may eventually lead to this debilitating disease.\(^1\) Approximately one half of women and one in eight men over 50 years of age will have a fracture due to osteoporosis.\(^5\) The cost to treat bone fractures associated with osteoporosis alone reaches $10 to $15 billion annually.\(^1\)

Osteoporosis is a disorder of compromised bone strength. This reduced bone strength is a function of both bone DENSITY and bone QUALITY. Bone density is the amount of bone per given area. Bone quality is a combination of the actual structure of bone, bone turnover and mineralization, and the cumulative damage to bone.\(^1\) Bone status is a dynamic process, with new bone constantly being formed. Bone turnover is also termed “bone remodeling” and is basically the renewal of old bone. The three most important compounds in bone health, other than calcium, are parathyroid hormone, vitamin D, and calcitonin. Parathyroid hormone and vitamin D help to maintain the calcium concentration in blood. Vitamin D’s primary action is to increase the serum concentration of calcium by increasing intestinal absorption of calcium. Calcitonin can increase mineral stores in bone or increase calcium loss in the urine. A signal from the parathyroid hormone or 1,25-dihydroxyvitamin D results in the maturation of osteoclasts which remove a portion of bone by resorption. The osteoclasts are replaced by osteoblasts which produce a non-mineralized bone matrix which is soon mineralized. This whole process takes about 90 to 100 days.\(^2\)

The Risk

The major risk factors for primary osteoporosis include age, low body weight or body mass index, female gender, estrogen deficiency, white race, smoking, family history of osteoporosis, and history of prior fracture. Alcohol and caffeine use may also be associated with decreased bone mass. Some of the most common secondary causes of osteoporosis in women include hyperthyroidism, hypoestrogenemia, and the use of glucocorticoids or anticonvulsant drugs. Some common causes in men include alcoholism, hypogonadism, and the use of glucocorticoids. Decreased estrogen production during menopause is the major cause of reduced bone density in women during later life. In men, maintenance of testosterone levels is equally important.\(^1\)

The Role of Calcium and Vitamin D

The most important nutrient for bone health is calcium. Unfortunately, a significant portion of the population does not receive adequate amounts of this mineral. Vitamin D is also very important for maintaining bone mass. Starting in adolescence, the consumption of dairy products decreases, which affects the intake of both calcium and vitamin D. The current recommendations from the Institute of Medicine suggest that older adults get 1,000 to 1,500 mg per day of calcium. The current recommendation for vitamin D intake in adults is 400 IU to 600 IU daily.\(^1\) Only 50% to 60% of the adult population achieves their recommended intake of calcium. Ideally calcium should come from the diet.\(^1\) The use of milk and dairy products in the diet improves the nutritional quality of the diet much more than calcium supplements alone.\(^3\) If calcium supplements are needed, they should have a USP designation to ensure bioavailability.\(^1\) Only 500 mg of calcium can be absorbed at one time, so it is important to space out the intake of calcium throughout the day.\(^3\)

Drug therapies available for the prevention and treatment of osteoporosis include alendronate (Fosamax), risedronate (Actonel), raloxifene (Evista), and hormone replacement therapy (HRT). Alendronate and risedronate are bisphosphonates. They are effective at increasing bone mineral density and reducing the risk of osteoporosis-related fractures.\(^1,5\) Raloxifene is a selective estrogen receptor modulator. It produces pro-estrogen effects in some tissues and anti-estrogen effects in other tissues. It is effective at reducing bone loss and reducing risk for fractures.\(^1,5\) HRT is a mainstay for the prevention and treatment of osteoporosis. Calcitonin may also be used.\(^1\)

More...
The benefits of drug therapies seen in clinical trials for osteoporosis have occurred with the concurrent supplementation of calcium and vitamin D. Calcium and vitamin D intake helps adjust increases in parathyroid hormone levels and bone resorption due to age. Although several new and very effective treatments for osteoporosis now exist, optimal therapy also requires calcium and vitamin D intake at the recommended levels. It has been shown that the intake of sufficient amounts of calcium can increase bone mineral density in the spine and reduce fractures.

People most prone to low vitamin D levels are the elderly. Vitamin D is produced in the skin upon exposure to sunlight. The amount of vitamin D produced depends on the time of day, season, geographical latitude, and pigment of the skin (more vitamin D is produced in fair-skinned individuals). Ten to 15 minutes of sun exposure is usually all that is needed to produce sufficient amounts of vitamin D. Factors that reduce the quantity of vitamin D produced include sunscreen, clothing, and air pollution. The ability to produce vitamin D is also reduced in the elderly, in those who are housebound and have little contact with sunlight, and during the wintertime. Supplementation with vitamin D in addition to calcium has been shown to reduce the incidence of non-vertebral fractures. Calcium may be particularly helpful in reducing bone loss in women more than five years postmenopausal.

It is important that patients play an active role to help prevent and treat osteoporosis. Physical activity can help reduce a person’s risk of osteoporosis. Physical activity early in life can result in a higher peak bone mass. Resistance and high impact exercises probably provide the most benefit. The effect of exercise during middle life on bone mass is not known, but there is definitely positive benefits in slowing bone loss during later years.

**Conclusion**

Osteoporosis affects a significant portion of the population, and as such, improvements in overall bone health are warranted. Close attention should be paid to the prevention of osteoporosis, including an emphasis on diet and physical activity. While effective therapies have been developed, they are not as beneficial alone as they are with the addition of calcium and vitamin D. New drugs for osteoporosis should not be seen as replacements to calcium and vitamin D, as optimal treatment requires the inclusion of these two very important nutrients. Be sure to counsel patients receiving prescription medication for treatment of osteoporosis to continue to take calcium and vitamin D. Attached is a patient handout to aid in counseling patients on the importance of calcium and vitamin D in osteoporosis.

**References**


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