

## PREVENTION AND TREATMENT

The development and progression of osteoporosis is dependent on two separate processes: the formation of bone mass during childhood and young adulthood and the rate of bone loss in later life. The activity of the cells involved in the formation and regeneration of bone tissue is regulated by many factors, including hormonal levels and balances, diet, the metabolic effects of caffeine intake and cigarette and alcohol use, and external physical forces such as body weight and exercise. Because of the complex nature of osteoporosis, its prevention and treatment must be comprehensive, emphasizing diet, exercise, drug and hormonal therapies, and behavioral changes.

**Primary Prevention.** The best defense against osteoporosis is the accrual of maximum bone mass in childhood, adolescence, and young adulthood. Primary prevention includes educating youth on the dangers of bone disease in later life, with an emphasis on the importance of diet and exercise in earlier years.

- Children and adolescents should be encouraged to participate in various forms of physical exercise, ranging from organized sports to family-centered activities. Parents need to ensure that their children are physically active and find ways to incorporate exercise into their daily schedule.
- Parents need to be made aware of the important role of calcium in their children's diets in building and maintaining bone. The National Institutes of Health recommends that children aged 1 through 10 years receive from 800 to 1,200 mg of calcium every day, while adolescents and young adults aged 11 through 24 years need from 1,200 to 1,500 mg daily (11). Families should be counseled on the benefits of drinking skim or 1% milk to lower their fat intake while still getting their necessary calcium. Diets low in calcium should include a calcium supplement.
- Optimal calcium absorption requires adequate levels of vitamin D, which are normally obtained from exposure to sunlight (as little as 10 minutes per day). Unless they are home bound, children and young adults rarely need a vitamin D supplement.
- The roles played by cigarette smoking and immoderate alcohol use and caffeine consumption in the development of osteoporosis need to be emphasized in the health education of young people.

- Physicians play an important role in the prevention of osteoporosis by discussing the problem with their patients. A study done by Gallagher et al. reported that only 49% of study participants stated that a physician had discussed osteoporosis with them, and most of the discussions came only after a diagnosis of osteopenia/osteoporosis (12).

**Secondary Prevention.** Secondary prevention activities should be promoted among middle-aged and older adults who are at risk for osteopenia and osteoporosis. Hormonal therapy, weight-bearing exercise, and calcium supplementation are the major forms of prevention among these ages. Bone mass screening through bone densitometry is often recommended for high-risk individuals.

- Hormone replacement therapy (HRT) has shown to be very beneficial in the prevention and treatment of many health conditions. Recently, scientific evidence has prompted health professionals to no longer prescribe it as a form of treatment or prevention for osteoporosis. There are certain contraindications to HRT, including breast cancer or a strong family history of breast cancer, active liver disease, unexplained vaginal bleeding, and active vascular thrombosis; however, studies are currently under way on a low-dose, plant-based estrogen that appears to have fewer risks and side effects. Each woman needs to weigh the risks and benefits of HRT individually with her physician.
- At any age, physical activity positively affects bone mass. Exercise programs in middle life need to be aimed at increasing strength, coordination, balance, and flexibility. A regular regimen of weight-bearing exercises in which bones and muscles work against gravity is recommended. Such exercises include walking, tennis, stair climbing, and weightlifting.
- The NIH recommends an intake of 1,000 mg of calcium among adult women aged 25-49 who are premenopausal and those aged 50-64 who are postmenopausal but taking estrogen therapy (10). Women aged 50-64 who are not taking estrogen and all women aged 65 and older need 1,500 mg. The recommended intake is 1,000 mg for adult men aged 25-64 and 1,500 mg for men aged 65 and older.
- Most physicians now recommend bone density measurement for individuals at high risk for osteoporosis. These include postmenopausal women who are not on hormone replacement therapy; women with a family history of osteoporosis who have early onset menopause, amenorrhea, or a low body weight; persons with x-ray evidence of osteopenia; persons on long-term glucocorticoid therapy, or individuals with hyperthyroidism or hyperparathyroidism.

The NOF has established guidelines regarding individuals that should consider bone density testing:

- All postmenopausal women under age 65 who have one or more additional risk factors for osteoporotic fracture (besides menopause)
- All women age 65 and older regardless of additional risk factors
- Postmenopausal women who present with fractures (to confirm diagnosis and determine disease severity)
- Women who are considering therapy for osteoporosis if bone density testing would facilitate the decision
- Women who have been on hormone replacement therapy for prolonged periods (longer than five years)
- Men who present with fractures
- Men with prostate cancer being treated with a gonadotropic releasing hormone agonist
- Individuals who have primary hyperparathyroidism
- Individuals who are on a long-term glucocorticoid treatment (1)

**Tertiary Prevention.** Tertiary prevention activities involve middle-aged and elderly individuals who have been diagnosed with osteoporosis or have already suffered an osteoporotic fracture. These activities are aimed at limiting future disability and aiding rehabilitation. Exercise programs, better nutrition, and drug therapy are all components of a comprehensive regimen designed to treat established osteoporosis.

- Fall prevention education and management is vitally important among the elderly. Nearly nine out of every ten fractures (87%) among older persons (aged 65+) are caused by falls. By 2050, it is estimated that there will be 650,000 hip fractures annually, or nearly 1,800 hip fractures per day (13). The National Osteoporosis Risk Assessment (NORA) study reported that individuals with osteoporosis were four times more likely to suffer a fracture. Despite these facts, only 5% of individuals with osteoporotic fractures are referred for further evaluation and treatment of osteoporosis (14). According to the National Center for Injury Prevention and Control, falls are the second leading cause of injury death among persons aged 65-84 and the leading cause among persons aged 85+ (15). Fall prevention programs

targeted at persons with osteoporosis stress exercises that improve balance and coordination. As inactivity increases the risk of falling also increases, even physically deconditioned persons with osteoporosis need a moderate exercise program tailored to their individual abilities and limitations. The Journal of the American Medical Association reported in 1994 that a one-year trial of high-intensity strength training by postmenopausal women had a positive effect on their bone density, muscle mass, muscle strength, dynamic balance, and overall physical activity level (16). Even frail nursing home residents were found to be capable of performing the recommended twice-weekly strength-training exercises and experienced improvements in mobility, thus reducing their risk of a fall. Improved physical fitness in an elderly patient also can result in less pain in the performance of daily activities.

- Calcium absorption is often a greater problem among the elderly, especially those who are home bound or in nursing homes. These individuals are at risk of vitamin D deficiency because they are not exposed to sunlight on a frequent basis and may need a vitamin D supplement to meet their daily requirement.
- Biphosphonates are a new class of drugs that increase bone mass by inhibiting bone resorption. They offer an alternative to HRT in postmenopausal women and may be useful in men and patients undergoing long-term glucocorticoid therapy. Two biphosphonates, etidronate and alendronate, are presently being used to treat established osteoporosis, and others are undergoing clinical trials. (While not yet FDA approved for the treatment of osteoporosis, etidronate has been approved for other bone diseases and is prescribed extensively for osteoporosis as well.) Approximately 80% to 85% of patients have been shown to maintain or increase bone mass with biphosphonate therapy (4).
- Calcitonin is another drug therapy that has been approved by the FDA for the treatment of osteoporosis. Calcitonin is a natural hormone that increases bone density by slowing the rate of bone loss and also relieves bone pain in some patients. It is administered either as an every-other-day injection or as a once-a-day nasal spray.
- A new class of drugs known as selective estrogen receptor modulators, or SERMs, are being clinically tested as an alternative to HRT. These drugs act as estrogen in the skeleton and cardiovascular system, while blocking estrogen's effects in the breast and uterus. One type of SERM, raloxifene, was approved by the FDA in 1997 for the treatment of osteoporosis in both men and women (17).