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Osteoporosis

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Osteoporosis refers to a decreased density (mass per unit volume) of normally mineralized bone which is below that needed to maintain the skeletal function of adequate mechanical support. Fractures are the most important complication of osteoporosis, with associate pain, deformities, and loss of function.

More than 1.5 million Americans have fractures attributable to osteoporosis each year. A reduction in osteoporosis-related fractures can be achieved by a reduction in falls, and by prevention and treatment of bone loss. This essay will be primarily concerned with methods of preventing and treating bone loss as a result of osteoporosis.

Survivors of paralytic poliomyelitis may have a greater risk for osteoporosis-related fractures. Weakness from poliomyelitis may have caused a chronic reduction in or complete absence of weight bearing activity, with a resultant reduction in bone mass. (This residual weakness from past paralytic polio may also predispose post-polio individuals to more frequent falls.) In addition, a long period of immobilization at the time of acute poliomyelitis or after a surgical procedure could have produced significant bone demineralization. Studies show that as much as 30-40% of bone mass may be lost after six months of complete immobilization. However, restoration of normal activity may result in reversal of disuse-related bone loss.

For these reasons, maneuvers to prevent a further loss of bone mass and to decrease the risk of falls may be necessary to prevent osteoporosis-related fractures in post-polio individuals. Unfortunately few studies have assessed the effect of specific therapies on osteoporosis resulting from disuse and various disease processes.

Living bone is never metabolically at rest; it is continually undergoing a process of remodeling through new bone formation and bone resorption (to "dissolve"). This is accomplished through the action of specialized bone cells called osteoblasts and osteoclasts. Osteoblasts are bone cells which produce new bone, whereas osteoclasts are bone cells which resorb or destroy bone. Usually there is a balance between the process of bone resorption and formation. Osteoporosis can occur either with a relative increase in bone resorption or a decrease in bone formation.

The structure of bone is not uniform throughout the skeleton. There are two types of bone: trabecular and cortical. Trabecular bone is concentrated in the spine at the end of long bones (such as at the hip). Because

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Vaccine Injury Compensation: A Battle Won

Shannon Dickson contracted polio in late 1962, when he was 10, after receiving the oral polio vaccine on a Sabin Sunday. Within two weeks he developed the classic fever, rigid back, and neck pain. He remembers falling down going to the bathroom, having weakness in all four limbs, and swallowing problems.

He wore leg braces for approximately nine months, went through a year and a half of intensive physical therapy for his legs and shoulders, making a complete recovery with some atrophy of the pectorals.

Because his was the only recorded case of polio in the Houston area at the time, he and his family commonly accepted that it was vaccine caused. Throughout the rest of his childhood, Shannon forgot about polio and participated in sports and many outdoor activities.

During the late '70s and '80s fitness boom, he started jogging and light weight lifting. Within a year he experienced multiple sprains and strains, muscle fatigue, and secondary orthopedic problems.

In 1984, he began tripping and falling. Also at this time, he was in a minor auto accident which ended up being a smoke screen. For the next three years, his problems were blamed on the accident. In 1987, he had a cervical fusion for a ruptured disc. He had

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osteoporosis involves primarily a loss of trabecular bone, areas with predominantly trabecular bone are at greatest risk for osteoporosis-related fractures.

The two most common types of osteoporosis are post-menopausal osteoporosis and age-related osteoporosis. Both occur as part of the normal aging process. Bone mass normally increases until the age of 30. After a short period of stabilization, age-related bone loss begins. In women, the rate of bone loss increases to 2-3% a year following menopause. However after 8-10 years, this rate of bone loss returns to baseline levels. Over their lifetimes, women lose about 50% of the trabecular bone and 30% of the cortical bone, and men lose about 30% and 20%, respectively. Thus, the degree of peak bone mass attained in early adulthood together with the rate of subsequent bone loss will influence the probability of developing osteoporosis later on in life.

Postmenopausal osteoporosis involves primarily an increased bone resorption, while age-related osteoporosis involves primarily decreased bone formation. Other less common causes of osteoporosis need to be considered in a patient with bone loss. These rarer forms can include hereditary causes of osteoporosis, endocrinological abnormalities, diet-related osteoporosis, drug-induced osteoporosis (from drugs such as glucocorticoids, methotrexate, and some anticonvulsants), disuse osteoporosis (e.g. from immobilization due to illness or neurological causes), disease-related osteoporosis, and idiopathic osteoporosis (of unknown cause).

Many factors which can influence the attainment and maintenance of peak bone mass have been identified. Race is important in the development of osteoporosis. Blacks have a greater bone mass than whites and Orientals at all ages, and thus a lower prevalence of osteoporosis. Osteoporosis occurs less frequently in persons from southern Europe than in those of northern European descent.

Nutritional factors, primarily inadequate calcium and vitamin D intake, are implicated in the development of osteoporosis. Our need for calcium increases as we grow older because of less efficient intestinal calcium absorption, and other causes. The recommended calcium intake for young adults is between 750-1000 mg per day. Healthy premenopausal women over age 30 need about 1000 mg calcium per day (that amount contained in one quart of milk) and pregnant and lactating women need 1500 and 2000 mg per day, respectively. Individuals over age 50 need 1500 mg calcium per day. Unfortunately, the average American woman consumes less than 500 mg calcium per day and thus is in a chronic state of calcium deficiency.

Vitamin D is needed for intestinal absorption of calcium. The active form of vitamin D is produced in our skin by a reaction stimulated by ultraviolet radiation (in sunlight). Certain behavioral factors important in the development of osteoporosis have also been identified. Daily weight-bearing activity is essential for skeletal health. Studies have shown a direct relationship between weight-bearing activity and bone mass. In addition, behaviors such as cigarette smoking and excessive alcohol intake can induce bone loss.

Prevention of osteoporosis is currently the only reasonable management approach for this condition. An adequate calcium intake should be maintained in postmenopausal women. Calcium supplementation at doses of 1000 mg per day or more may decrease post-menopausal bone loss by as much as 50% at some sites. The result in premenopausal women from such supplementation are unclear. However, calcium supplementation has not been shown to replace the effects of estrogen-replacement therapy in post-menopausal women. Vitamin D supplementation may also be needed. Weight-bearing exercise such as walking or aerobics (if possible) should be encouraged. There appears to be a relationship between degree of weight-bearing exercise and bone mass. In addition, a regular weight bearing exercise program has been shown to increase bone mass in post-menopausal women. Cigarette smoking and excessive alcohol intake should be avoided because these behaviors can be damaging to bone. If possible, drugs that can cause bone loss should be avoided.

In those patients who have a low or relatively low bone mass, medications may be necessary to reduce post-menopausal and age-related bone loss. Currently the most effective treatment for this is estrogen-replacement therapy started at menopause. Estrogen therapy is most effective when started early after menopause. Estrogen therapy can prevent early post-

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menopausal bone loss, can increase bone mass in the spine by 5% in women with osteoporosis, and can reduce fractures by 50%.

Estrogen use, however, has certain associated risks such as an increased incidence of endometrial cancer and possible an increased incidence of breast cancer. Estrogen therapy is also contra-indicated in certain patients. In women who are unable to take estrogens or in men, calcitonin can be used. Currently, calcitonin is administered intravenously. A form of calcitonin which can be administered with a nasal spray is available in Europe and is undergoing evaluation for use in North America. Calcitonin has been shown to transiently increase trabecular bone mass and to retard bone loss from cortical bone in post-menopausal women. Fluoride increases bone mass, however the bone formed was found to be abnormal and more susceptible to fracture. It is possible that a lower dosage of fluoride may still be helpful. Other possible treatments that are currently undergoing evaluation are biphosphonates, parathyroid hormone, and growth factors.

The prevention of osteoporosis-related fractures should also include strategies to reduce the risk for falls. Prevention of falls can involve various measures such as discontinuation of sedating medications, use of a leg brace, use of a cane or crutch to improve balance, use of rubber-heeled shoes, absence of "throw-rugs," and use of a night light.

In conclusion, even though much work remains to be accomplished on the prevention and management of osteoporosis, some recommendations and specific treatments are available. New medications may become available in the next decade that are more easily administered and are more effective in treating established osteoporosis.

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Resources:

National Osteoporosis Foundation, 1150 17th St., NW, Suite 500, Washington DC 20036 USA (202/223-2226) offers educational materials.

Osteoporosis: The Bone Thinner, Menopause, Managing Menopause, and Should You Take Estrogen? are available from **National Institute on Aging,** P.O. Box 8057, Gaithersburg, MD 20898-8057 USA (800/222-2225). They will also send a complete listing of their publications upon request.

New Polio Clinics Open

Department of Rehabilitation Medicine at New York University Medical Center, 400 E 34th St., New York, NY 10016 has recently opened a post-polio clinic. The clinic will be directed by Dong Ma, M.D. Call 212/263-6339 for appointment information.

The Physical Medicine and Rehabilitation Center, PA in New Jersey, 15 Engle St., Suite 205, Englewood, NJ 07631 USA (201/567-2277, FAX 201/567-7506) also has recently opened a clinic under the auspices of Donald Liss, MD, and Howard Liss, MD.

Participants Needed

Post-polio survivors are needed as volunteers for a research project at the University of Texas Southwestern Medical Center at Dallas. The purpose of this study is to examine changes in the ankle, hip, and knee motion that occur during walking in persons, with a history of polio.

All testing is non-invasive and can be completed in one afternoon. The study is a non-compensated study. It requires that the subjects be ambulatory and without cardiopulmonary disease.

If you are interested, please call Melody Sykes at the Mobility Research Lab at 214/351-2041.

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