Osteoporosis

BY LISA J. HUNT, D.O.

Osteoporosis by definition is a generalized skeletal disorder characterized by compromised bone strength. Osteoporosis is a progressive disease in which the bones gradually become weaker and weaker; therefore causing changes in posture and thus predisposing affected individuals to an increased risk of fracture. The term "osteoporosis" means "porous bones." Osteoporosis is a significant cause of pain, disability and death throughout the world. Fifty-six percent of women and 18 percent of American men 50 years of age and older show signs of some degree of osteopenia (low bone mass) or osteoporosis. Due to the physiological, nutritional, and hormonal differences between males and females, osteoporosis affects many more women than men. The costs to the U.S. health care system total more than $16 billion annually.

Osteoporosis is a multifactorial disease arising from genetic, hormonal, metabolic, mechanical and immunologic factors. Bones provide the support structure for the body, protect vital organs, and play a key role in mineral and acid-base balance. Bone is constantly restoring itself. Osteoblasts are responsible for making bone and osteoclasts are needed to remove old bone (its minerals are absorbed for use elsewhere in the body). If, however, the osteoclast breaks down bone more quickly than it is replaced, then bone tends to become less dense and more likely to break.

Our bones are at their strongest at the age of approximately 30 years. Thereafter, bone strength begins to decline. Bone loss begins in both men and women in the fourth decade. For women, this decline accelerates at menopause. Thus, if one has not accumulated sufficient bone mass during the formative years (childhood, adolescence, and early adulthood), or if there is too great of a loss in one's later years, then one is at increased risk of developing osteoporosis. In general, men reach higher peak bone mass, have larger cortical thickness, and have better preservation of bone microstructure. Therefore, they are half as likely as women to experience a fracture. Bone is dynamic, and it is constantly responding to a range of hormonal, metabolic, neurologic, and mechanical signals.

Osteoporosis is diagnosed by measuring bone density. Bone mineral density is a function of bone gained during growth and lost during aging. Bone strength is determined by both bone quality and bone mass. Bone quality is influenced by bone microarchitecture and the composition of the bone matrix and mineral. It is important to note that, at present, there is no established way of assessing bone quality in a clinical practice setting. Bone mass, on the other hand, is most commonly assessed using a DEXA scan. The standard of measurement according to the World Health Organization was determined by measuring the bone mass of people who have not had fractures related to low bone mass. Thus, the standard measurement is that of a 30-year-old premenopausal woman. The usefulness of screening for fracture risk with DEXA has been questioned. Osteoporosis is defined as bone mineral density more than 2.5 standard deviations below the mean for young (30-year-old) adults. Osteopenia is defined as bone mineral density of 1-2.5 standard deviations below the young adult mean.

Bone mineral density is not the only determinant of fracture risk. For example, heavy women are less likely to fracture a bone in a fall than thin women and certain prescription medications can affect fracture risk as well. There is also a wide overlap between the bone densities of women who will eventually suffer a fracture and those who will not. Finally, it is possible to have osteoporosis in one area of the skeleton and not in another. The spine and hips are the areas that cause most concern because hip fractures in older adults require extensive time to heal and osteoporosis in the spine may lead to loss of height and curvature of the spine.

Chronic inflammation is implicated in the process of aging and is thought to play a role in the development of a wide range of chronic diseases such as cardiovascular disease, Alzheimer's disease, diabetes and cancer. There is now growing evidence that osteoporosis is also in part a result of chronic low-grade inflammation.

Lifestyle and dietary factors are also important etiologies for osteoporosis. For example, insufficient calcium intake is one cause. Just as important are dietary practices that affect calcium metabolism: i.e. caffeine, alcohol, and many drugs that appear to have detrimental effects on calcium absorption. Bone density is also dependent on exercise. Weight bearing exercise stimulates the deposition of more mineral in bone, especially the bones of the legs, hips and spine. Conversely, a lack of

exercise accelerates the loss of bone mass. Other influential factors are smoking, late puberty, early menopause, family history, hyperthyroidism, and chronic liver or kidney disease.

Maintaining bone health is important in the prevention of osteoporosis/osteopenia. Calcium is an essential nutrient for building and maintaining healthy bones. Approximately 99% of the body's calcium is in the bones. However, high calcium intake does not ensure strong bones and low calcium intake does not necessarily lead to weaker bone. Calcium is absorbed in the small intestine by a transcellular transport mechanism that requires adequate vitamin D. The appropriate ratio of essential fatty acids in the diet is also necessary for bone health. Studies have shown that omega-3 fatty acids enhance calcium absorption, reduce calcium excretion and improve mineralization of bone matrix and bone strength. Protein is required as well for bone formation. However, it is important that this amount is adequate and not excessive. In addition, two naturally occurring classes of vitamin K (K1, K2) are useful in the prevention and therapy of osteoporosis. Lastly, magnesium supplementation has been shown to increase bone mineral density as well as reduce fracture rates.

At this point in time, osteoporosis is not a curable condition. However, there are various methods that may slow down the process of bone loss. Maintaining an appropriate body weight, lifestyle and dietary changes, and taking the right nutrients and minerals is a good start. Weight bearing exercise is equally important. Lastly, if needed, prescription medications may be necessary. SM