A Review of Osteoporosis in the Older Adult

Paloma Alejandro, MD*, Florina Constantinescu, MD, MS, PhD

KEYWORDS

• Osteoporosis • Bisphosphonates • FRAX • Drug holiday • Hip fractures • Elderly • DXA

KEY POINTS

- Fractures and osteoporosis are common, especially in the elderly population. Hip fractures may be devastating.
- Osteoporosis in men is greatly unrecognized and untreated.
- Treatment of osteoporosis is generally recommended in postmenopausal women and men 50 years old or older who have a bone mineral density T score of −2.5 or less, a history of previous spine or hip fracture, or a Fracture Risk Assessment Tool score indicating increased fracture risk.
- Bisphosphonates, teriparatide and denosumab have proven to reduce risk of hip, vertebral, and nonvertebral fractures. Bisphosphonates are used usually as first-line treatment in patients if no contraindications. Teriparatide reduces the risk of nonvertebral and vertebral fractures.
- Individualizing therapy is important. This includes balancing the risks and benefits of bisphosphonates in order to enact a drug holiday. For patients at lower risk for fracture, drug holidays after 5 years of alendronate therapy or 3 years of zoledronic acid therapy can be considered.

INTRODUCTION

Osteoporosis is a disorder with major impact in Western society and globally, and osteoporotic fractures are associated with significant burden of health care cost, morbidity, and mortality.[1] A vast majority of patients remain undiagnosed and untreated, especially high-risk patients.[2] In patients 65 years and older, the increase in incidence of osteoporotic fractures is accompanied by grim effects on disability and mortality.[3] Older patients are at increased risk of nursing home admissions and long-term stay after hip osteoporotic fractures, as compared with myocardial infarctions and stroke.[4] In 2014, a discouraging study was published assessing the frequency of starting bisphosphonate treatment after hip fracture in the United States

Disclosure Statement: The authors have nothing to disclose.
Division of Rheumatology, MedStar Washington Hospital Center, Georgetown University Medical Center, 110 Irving Street Northwest 2A-66, Washington, DC 20010, USA
* Corresponding author.
E-mail address: paloma.alejandro@medstar.net

Clin Geriatr Med 33 (2017) 27–40
http://dx.doi.org/10.1016/j.cger.2016.08.003
geriatric.theclinics.com

(2002–2011). In 2002, 40% of the patients started medication within 12 months of hip fracture, which decreased to less than 20% in 2011 nationwide.[5]

Osteoporosis is defined as a deterioration in bone mass and microarchitecture of bone, along with increased fragility, that predisposes bones to fracture.[6] Two main pathophysiologic processes generate bone loss. The first results from estrogen deficiency and affects trabecular bone, known as postmenopausal osteoporosis. This type of osteoporosis affects mainly women and is associated with vertebral fractures and hip fractures. Osteoblasts respond to many external and internal stimuli including hormones (parathyroid hormone [PTH], vitamin D). As a result to these stimuli, macrophage colony-stimulating factor and membrane-bound receptor activator of nuclear factor-kappa B ligand (RANKL) are produced. These, in turn, are critical factors for osteoclastogenesis. Binding of RANKL with its receptor RANK in osteoclasts stimulates their differentiation and prevents osteoclast cell death. Osteoprotegerin produced by osteoblasts inhibits the RANK-RANKL pathway.[7] Conversely, estrogen, transforming growth factor-β, and mechanical force inhibit RANKL expression, thus suppressing osteoclast cell formation and differentiation, ultimately decreasing bone resorption.[8]

Another advance in bone biology is the Wnt (wingless-type MMTV integration site) signaling pathway in osteoblasts, which is important for bone formation. Inhibitors of this pathway are sclerostin and dick-kopf WNT signaling pathway inhibitor 1. Sclerostin is expressed in osteocytes as a response to mechanical stress.[9]

A second type, recently known as senile osteoporosis, mainly affects cortical bone, predisposing elderly patients to hip fractures. These changes in bone mass associated with aging are multifactorial; they include changes in hormones as well as vitamin D insufficiency, leading to secondary hyperparathyroidism, thereby enhancing osteoclastic bone resorption. Recent evidence of a possible link between aging and senile osteoporosis has been described. Lack of lamin A/C, a special scaffolding protein found in bone structure cells, is seen in aging osteoblasts and is associated with reduced osteoblastic activity, lipodystrophy, and fat redistribution as observed in mice studies.[10]

Osteoporosis in men may be secondary to hypogonadism, corticosteroid use, and excessive alcohol use. In men, bone loss increases after age 70. Osteoporosis in men remains untreated and unrecognized.[11,12] In a study of elderly male nursing home residents with hip fractures, 66% of the patients had hypogonadism.[13] In elderly male patients, vertebral fractures are more common.[14] Testosterone depletion has direct effects on cortical and trabecular bone mass resulting in decreased bone mineral density (BMD) in hypogonadal patients.[15] Osteoporosis is most often identified after the first hip fracture, which itself is a risk factor for future osteoporotic fractures.[11]

A comprehensive approach to the diagnosis and management of osteoporosis includes a detailed history, physical examination, BMD assessment, radiological studies to diagnose fractures, and FRAX World Health Organization (WHO) 10 year estimated fracture probability calculation. The diagnosis of osteoporosis by WHO criteria is established by BMD measurement using dual-energy x-ray absorptiometry (DXA) scanning or by adult vertebral or hip fracture in the absence of major trauma.[16] DXA measurement of the hip and spine is used to establish and confirm the diagnosis of osteoporosis. The BMD predicts fracture risk and has been shown to correlate with bone strength and future fracture risk.[16] BMD is expressed in grams per square centimeters, and it is compared with an adult population of the same gender (T score), or to the BMD of an age-, sex-, and ethnicity-matched reference population (Z score). Osteoporosis and low bone mass have been defined based on DXA measurements (**Table 1**).