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Overview of Osteoporosis

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Abstract

Osteoporosis is one of main basis of fracture and age associated disease, more common in women than men. Multifactorial factor are responsible for the pathogenesis of osteoporosis. Decrease of bone mineral density lead to risk factor of osteopenia. For the diagnosis of osteoporosis bone mineral density test is helpful to measure the bone strength. Radiography and dual energy X - ray help to identify the fracture assessment. The mini overview of article provide the etiology, clinical manifestation, pathogenesis, treatment and prevention of osteoporosis.

Objective

Osteoporosis means porous bones, causes bones to become weak and brittle associated with age. The aim of this review is to describe the overview regarding the identification and management of osteoporosis.

Introduction

Osteoporosis one of the major cause for the fracture among aged and adult population. Osteoporosis causes bone to become porous and so brittle that even mild alteration in posture may lead to fracture. Osteoporosis is skeletal disorder which affect the more than 10 million Americans [1]. Osteoporotic fracture are more oftenly reported in women i.e. 40% to 50% and 13 % in men [2,3]. However other study reported that the occurrence of fracture was similar in men and women [4]. The clinical consequences of osteoporosis can lead to osteopenia (decrease in bone density mineral). In normal young female bone mineral density ranges between 1 to 2.5 standard deviations of T score is considered as osteopenia. In Postmenopausal women, T-score <–1.0 are considered asosteoporosis and are also at increased risk of spine, lumbar vertebrae, hip, and wrist fracture. Fragility fractures of ribs are also common in men. Nonetheless, the above-mention diagnostic criteria is used forwomen as well as men [5]. Two categories of osteoporosis have been identified: primary and secondary. Primary osteoporosis is more common in females. In primary osteoporosis, postmenopausal osteoporosis generally develop after menopause because of drop in estrogen levels. Senile osteoporosis generally occurs at the age of 70 years in which thinning of bone occurred. Senile osteoporosis is degenerative osteoporosis because of wear and tear on the bones. Secondary osteoporosis is less common as it is caused by certain medical condition or treatment, which affect the bone mass and cause bone loss [6] (Figure 1).

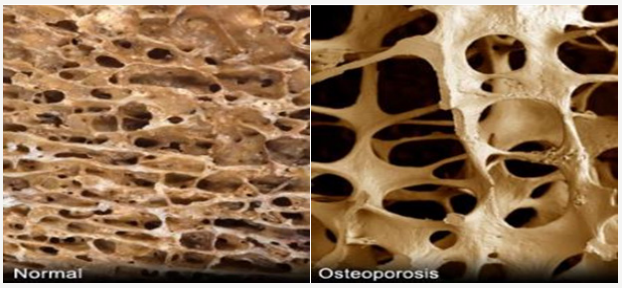

Figure 1: Comparison between the normal or osteoporotic bone.

Osteoporosis associated with fracture as characterized by less bone mass, porous bone and structural deterioration [2]. Mainrisk factor for osteoporosis are exhibited by age and sex. Risk appears to be increased during childhood and adolescent period where as risk get decreases in mature life because of peak bone mass. But after the age of 45 year particularly in women risk again increased while in men are risk generate above the age of 60 [7,8]. Genetic factors also play an important role in variation to bone density. A lifelong lack of calcium, estrogen, vitamin -D intake and increased consumption of alcohol and nicotine plays a major role for the occurrence of osteoporosis. Long term use of certain drugs like prednisone, dexamethasone, methotrexate, heparin can cause severe damage to bones and ultimately lead to bone loss. Some endocrine and gastrointestinal disorders

also contribute for the risk of osteoporosis [9]. Lack of physical activity is also one of the risk factor for osteoporosis and lower incidence of fracture is seen among rural and hilly communities because of effect of habitual exercise [10].

Pathophysiology

Remodeling of bone take place throughout the life for adaption of skeletal to mechanical changes. Bone remodeling cycle starts with degradation with osteoclast cell of old bone. Osteoblast cells synthesize the bone matrix. Osteoporosis is an imbalance between the activity of osteoblast and osteoclast cell. This imbalance will lead to bone degradation [11]. Decrease process of osteoblastogenesis can lead to spontaneous fracture in old age [12]. In osteoclast generation mainly two cytokines are essential and adequate that are macro phase colony stimulating factor (M –CSF) and receptor activator of nuclear factor kappa B ligand (RANKL). Bone marrow stromal cells and osteoblast are mainly responsible for releasing this two essential cytokines [13]. EphrinB2 is expressed by osteoclast where as ephrinB4 expressed by osteoblast, interact with each other so that osteoclast activity can be limited and osteoblast differentiation can be promoted [14] (Figure 2).

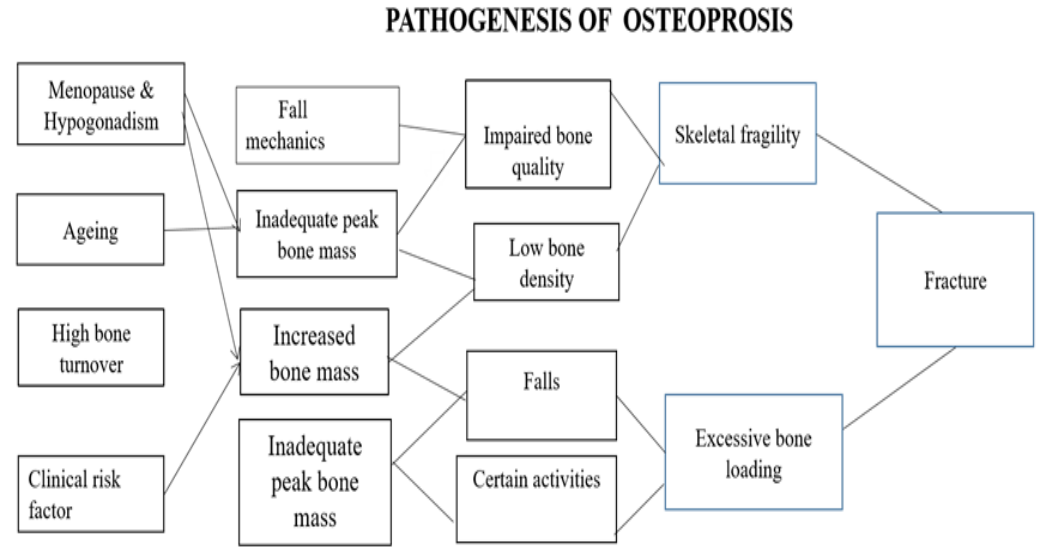

Figure 2: Pathogenesis of osteoporosis.

Clinical Manifestation

Osteoporosis has no any symptoms itself but the increased risk of bone fractures [15]. Patient with osteoporosis report dull pain, tenderness, stiffness, swelling, kyphosis, loss of height and vasomotor disturbances. Osteoporotic fractures occur in such situations where healthy people would not normally break a bone; they are therefore regarded as fragility fractures. Typical fragility fractures occur in the vertebral column, rib, hip and wrist. Bending and lifting increases the risk of vertebral fractures [16]. Pelvis, hip, femur, vertebral, humorous, forearm are commonly occurring fractures in osteoporosis. Vertebral strength is more decreased in women than men [17,18].

Diagnosis

Diagnosis of osteoporosis can be made by measuring bone mineral density and radiotherapy [19]. Bone mineral density testhelps to find out the bone strength [20]. Dual energy X-ray absorptiometry help to detect the bone mineral density with total body composition and fat content [21]. Other method used for the detection of osteoporosis is fracture assessment, ultrasound densitometer [22]. Computed tomography and peripheral dual energy X- ray absorptiometry [23]. Bone mineral density is reported as T score. It is expressed negative term. Diagnostic criteriafor osteoporosis according to WHO is following (Table 1).

Table 1: Diagnostic criteria for osteoporosis according to WHO.

Diagnostic criteria	T – score range	Bone mineral density
Osteoporosis	T Score ≤-2.5	2.5 SD or more below that of the mean level for a young-adult reference population
Osteopenia	-2.5<T-Score -1.0	Between 1.0 and 2.5 SD below that of the mean level for a young-adult reference population
Severe Osteoporosis	T Score ≤-2.5 with fragility fracture	2.5 SD or more below that of the mean level for a young-adult reference population with fractures
Normal	T-Score ≥ −1.0	Within 1 SD of the mean level for a young-adult reference population

Treatment

Calcium and vitamin D supplementation is considered to be effective treatment for osteoporosis [24]. In Pharmacology

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treatment aminobisphosphonates (zoledronic acid, alendronate, risedronate) are effective against both vertebral and non vertebral fractures. In addition to this hormone replacement therapies has been widely used for post menopausal women including raloxifene (selective estrogen receptor modulator)that preserve skeletal micro architecture , moderately increasing the bone mass and ultimately reduce the risk for fracture [25,26]. Kyphoplasty/ Vertebroplasty are conducted in the management of the vertebral compression fracture.It is a minimal invasive procedure that is effective for minimizing pain but along with this, complication rates are high as it may increase the incidence of new fracture of adjacent vertebras [27]. Hip protectors are used to reduce the risk of hip fracture to increase the thickness of soft tissue though trochanteric padding. This system is designed in such a way that it reduces the predicted peak force on the trochanter by absorbing the impact on hip while falling [28,29].

Prevention

Adequate intake of calcium is essential for maintenance of bone density and functioning of muscles. Primary and secondary prevention of osteoporosis include supplementation of calcium and vitamin D. Vitamin-D helps to enhance the absorption of serum calcium in small intestine. Weight bearing and non weight bearing exercise are effective in osteoporosis prevention. These exercises improve the posture, balance, liveliness and strength to prevent falls [29,30]. For reducing risk of spine fractures, combination exercise programs were found to be more effective. Osteoporosis related morbidities can be reduced by hearing and vision corrections, and removing fall hazards [31].

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