PRIMEVIEW

POSTMENOPAUSAL OSTEOPOROSIS

nature REVIEWS DISEASE PRIMERS

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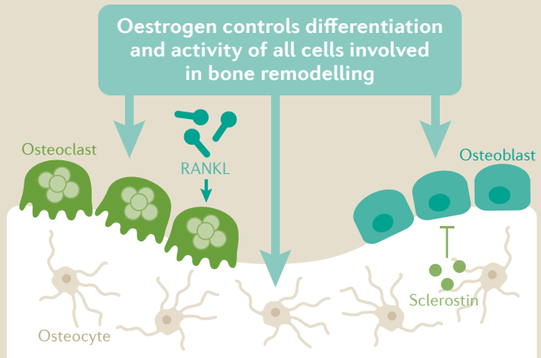
Osteoporosis is a metabolic bone disorder that is characterized by structural alterations and low bone mass, leading to increased bone fragility and susceptibility to fractures. Postmenopausal osteoporosis is the most common type and is caused by rapid bone loss due to postmenopausal oestrogen deficiency.

MECHANISMS

50% of women >50 years of age will experience an osteoporotic bone fracture during their lifetime

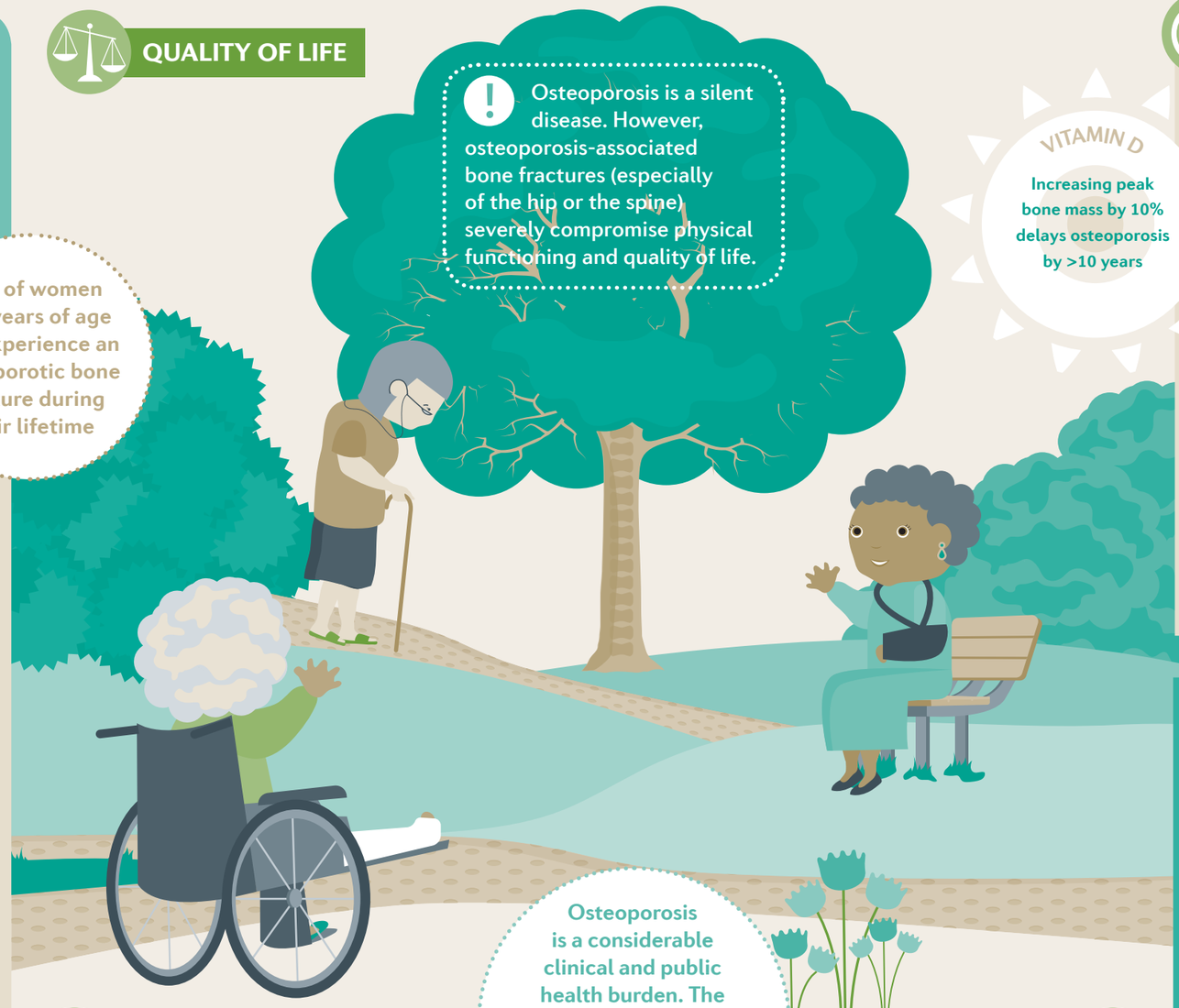
Throughout an individual's lifetime, bone is continuously being remodelled to repair microdamage and to adapt to mechanical and metabolic needs. Bone remodelling involves the bone-forming osteoblasts, the bone-resorbing osteoclasts and the mechanosensing osteocytes, and is tightly controlled by mechanical and endocrine factors, including vitamin D, parathyroid hormone and oestrogen. A decrease in oestrogen levels after menopause is the cause of postmenopausal osteoporosis, which is characterized by rapid bone loss at a rate of 3–5% for 5–10 years. Bone loss is due to a concurrent increase of bone resorption and bone formation — termed high bone turnover — in which resorption outpaces formation. This phase is followed by a slower phase of age-related bone loss, which is similar in men and women.



Insight into the molecular mechanisms that drive bone remodelling has led to innovative treatment strategies, including anti-RANKL and anti-sclerostin antibodies and cathepsin K inhibitors

QUALITY OF LIFE

Osteoporosis is a silent disease. However, osteoporosis-associated bone fractures (especially of the hip or the spine) severely compromise physical functioning and quality of life.



EPIDEMIOLOGY

In the United States, 10 million individuals >50 years of age are estimated to have osteoporosis, which is associated with about 1.5 million osteoporotic bone fractures each year. The incidence of osteoporotic fractures increases with age and, at all ages, is twice as high in women compared with men.

Osteoporosis is a considerable clinical and public health burden. The economic cost of osteoporotic bone fractures was estimated to be €37 billion in Europe in 2010.

DIAGNOSIS

Although far from perfect, bone mineral density (BMD) — measured by dual X-ray absorptiometry — is a key tool to diagnose osteoporosis. According to the WHO, osteoporosis is defined by a BMD of ≥2.5 standard deviations (T-score) below the average BMD of healthy young women.

VITAMIN D

Increasing peak bone mass by 10% delays osteoporosis by >10 years

PREVENTION

Prevention of osteoporosis is directed at gaining maximum peak bone mass and minimizing postmenopausal and age-related bone loss through nutrition, maintenance of a normal body mass index, regular physical activity and absence of smoking. Calcium and vitamin D supplementation is probably the most researched preventive strategy; studies have shown that supplementation might be beneficial in fracture prevention, but results are inconsistent. Fall prevention has a role in reducing the risk of osteoporotic bone fractures.

MANAGEMENT

The decision on whom to treat is made based on treatment algorithms (such as the WHO Fracture Risk Assessment Tool (FRAX)) that take into account the BMD along with key risk factors for fractures (for example, age and prior fractures). A 10-year hip fracture risk of 3% is usually used as a cut-off to initiate treatment. Bisphosphonates are given as first-line treatment, followed by denosumab (a RANKL inhibitor). Teriparatide (a fragment of parathyroid hormone) is the only approved anabolic agent. Oestrogen replacement therapy or selective oestrogen receptor modulators can be considered in specific conditions.

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