

Guidelines for the prevention of bone loss and the treatment of osteoporosis in postmenopausal women



Introduction

Osteoporosis and its associated problems are a major health concern for older Australians. The most important principles of management are maximizing peak bone mass and preventing postmenopausal bone loss, however, medication is available for the treatment of osteoporosis. The use of long-term hormone therapy (HT) has mixed risks and benefits that require individual assessment and management by a doctor.

In 2001, approximately 2 million Australians were estimated to be affected by osteoporosis, three-quarters of whom were women. This condition is more prevalent than hyperlipidaemia and incurs more years of healthy life lost than Parkinson disease, cervical cancer or rheumatoid arthritis. The total cost burden of osteoporosis is enormous. The health burden of osteoporosis will increase as the population ages.

Osteoporosis is defined as a compromise in bone strength, related to a decrease in bone density and an alteration in bone quality resulting in fragility fractures. An osteoporotic fracture is one that occurs with minimal or no trauma, typically defined as a fall from standing height or less.

Osteoporosis risk is increased by certain factors and by some medical conditions.

Diagnosis

Fracture risk assessment of postmenopausal women may include a history, an examination and an investigation.

A relevant history includes: age of menstruation, age of menopause, smoking history, prior fracture, family history of osteoporosis and medical conditions associated with an increased risk of osteoporosis.

Factors associated with increased risk of osteoporosis

- **Increasing age**
- **Premature or surgical menopause**
- **Family history of osteoporosis**
- **Previous low trauma fracture**
- Medical conditions
- Low calcium intake
- Low body weight (defined as BMI <20)
- Eating disorders associated with decreased weight
- Sedentary lifestyle and immobilization
- Lifestyle factors including smoking, alcohol, and lack of exercise or excessive exercise

Medical conditions associated with increased risk of osteoporosis

- **Prolonged corticosteroid therapy** and Cushing's syndrome
- Amenorrhoea lasting more than 6 months before the age of 45 years
- Chronic liver disease
- Chronic renal disease
- Malabsorption (eg. inflammatory bowel disease)
- Rheumatoid arthritis, multiple myeloma, hyperthyroidism
- Hyperparathyroidism - high blood calcium level
- Following organ transplantation

A routine examination includes measurement of height, with a 2 cm or more decrease in height over 3 years being suspicious for osteoporosis.

Possible investigations include bone mineral density (BMD) testing, such as, dual energy X-ray absorptiometry (DXA) which is the standard for the diagnosis of osteoporosis. Other investigations such as plain X-ray and blood tests may assist with diagnosis of underlying causes, management and follow up.

Investigations

Bone density scan by dual energy x-ray absorptiometry or DXA of spine and hip

Many postmenopausal women choose to have their bone density measured as a preventive measure. All postmenopausal women sustaining a low trauma fracture should be considered for bone densitometry because of the high likelihood of having osteopaenia or osteoporosis, particularly if this will improve the compliance with treatment.

DXA measures bone mineral density (BMD); a very good predictor of fracture risk. Postmenopausal women lose bone at a rate of approximately 1-2% per year; therefore scans every 2 years are generally adequate to follow women with low bone density. In patients who are likely to have increased bone loss associated with medical conditions, more frequent scans may be indicated.

Plain spinal X-ray

Plain X-ray films are commonly used to diagnose peripheral fractures, but also play an important role in the diagnosis of painful and asymptomatic spinal fractures. Only one third are symptomatic. A loss of greater than 20% of vertebral height is diagnostic of a vertebral fracture and in the absence of a history of trauma, suggests osteoporosis. In women over 65 years of age, spinal X-ray becomes important to show spinal degenerative disease called spondylosis, and spinal compression fractures or extra-skeletal calcification, which can artificially increase bone density so it may be misinterpreted as a normal result. This is why hip bone density is generally a more reliable measurement in the elderly.

Heel ultrasound scan

Heel ultrasound scans also predict fractures due to osteoporosis. However, a normal heel ultrasound does not exclude osteoporosis at the spine or hip and it cannot be used to monitor treatment. Although cheaper than DXA, in most cases DXA scans will still be required.

Blood tests

Blood tests are sometimes needed to exclude specific medical conditions that may cause osteoporosis.

Management of postmenopausal osteoporosis and osteopaenia (low bone density)

Although osteoporosis is a common condition, a cause should be identified if possible and the specific disease processes treated appropriately. Decisions to commence therapy should take account of the woman's age and T-score. The T-score is the difference between the woman's BMD and that of a young woman aged 30, expressed as a number of standard deviations.

WHO (World Health Organisation) definitions of low bone density for postmenopausal women using DXA

- Normal = T-score > -1
- Osteopaenia = T-score -2 to -2.5
- Osteoporosis = T-score < -2.5

In general, interventions are indicated for women with bone densities more than 2.5 SD units below the young normal mean (T-score < -2.5), with preventive measures to be considered before that level is reached. Age is also an important additional consideration when deciding to commence treatment.

General lifestyle measures are recommended for building bone strength and preventing falls

Lifestyle modification such as exercise, eliminating or reducing caffeine and alcohol consumption, and quitting smoking are all lifestyle modifications that can optimize peak bone mass, minimize bone loss, and ultimately prevent fractures. These interventions are recommended for women and men of all ages.

Exercise

Physical activity is one of the most important non-medical approaches to preventing fractures in people at risk of osteoporosis. Exercise can improve bone strength, muscular performance, joint flexibility, and balance to decrease the risk of falls and fractures.

Walking, jogging, and stair climbing, all improve BMD in healthy, sedentary postmenopausal women.

Weight-bearing exercise increases BMD in women of all ages. And, regular weight-bearing and muscle-strengthening exercises reduce the risk of falls and fractures. Swimming is not considered a weight-bearing exercise but can be used in conjunction with other exercises. Weight lifting can also improve bone strength and muscle mass. Exercise programmes that include weight-bearing activity three or four times per week for 45 minutes or weight lifting two or three times per week for 20-30 minutes are beneficial.

Exercises such as cycling, low-impact or water aerobics, and chair exercises may be sufficient to improve bone density in women with restricted activity. Muscle strengthening exercises and balance training (eg. resistance training and taichi) muscle mass and mobility.

Falls Prevention

Measures for personal and home safety are advisable for older women. Practical examples are described below, for, modifying the environment

Reduce the risk of slipping and tripping by eliminating slippery surfaces, loose rugs, narrow passageways, and dangerous furniture.

Most people find trips, slips and loss of balance as the cause of the fall, whereas only a small proportion experience dizziness or feeling faint.

Modifying living habits

- wear appropriate footwear
- take care when walking up or down steps, especially if wearing bifocals
- taking care at night and in poorly lit conditions
- install appropriate aids (eg. supportive hand rests, rails and non-slip bathmats)
- review medications (eg. sedatives, antidepressants or certain antihypertensives that might predispose patients to falls)
- correct poor vision, and
- involve community agencies & occupational therapists to:
 - provide support services to help implement the modifications required to reduce the risk of injury
 - ensure nursing and physiotherapy services are provided when needed.

Medication

Although lifestyle prevention measures are important, pharmaceutical agents may be recommended to prevent fractures due to osteoporosis. Some agents are also used to prevent postmenopausal bone loss.

Bisphosphonates

Bisphosphonates are potent inhibitors of bone resorption. Currently three bisphosphonates (alendronate, risedronate and etidronate) are approved in Australia on the Pharmaceutical Benefits Scheme (PBS) for the treatment of established osteoporosis in postmenopausal women with fracture due to minimal trauma. The first two are more potent and reduce spinal, non-spinal and hip fractures. Etidronate is the least potent bisphosphonate but is likely to prevent spinal fractures. Calcium should not be taken at the same time of day as a bisphosphonate as it interferes with their absorption. Bisphosphonates should also be taken at least 30 minutes before meals.

In patients who are intolerant of oral bisphosphonates, intravenous bisphosphonates such as pamidronate and (more recently) zoledronate are sometimes used.

Selective oestrogen receptor modulators (SERMS)

Raloxifene is a selective oestrogen receptor modulator (SERM) which acts to decrease bone resorption like oestrogen but without stimulating the breast or uterus. Lipid profiles are improved and breast cancer incidence has been reported to be reduced by 60-70% over 4 years. Raloxifene is available on the PBS for established postmenopausal osteoporosis in patients with fracture due to minimal trauma.

Hormone therapy (HT)

The role of long term postmenopausal HT in the prevention and management of osteoporosis remains controversial following publication of the results of the Women's Health Initiative (WHI) study of combined oestrogen and progestin therapy (cHT) and its study of oestrogen alone therapy (ET). These studies show that risks with ET are less than cHT and are due to very small increases

in risk of deep venous thrombosis (DVT) and stroke. In particular, there was a trend for breast cancer to be reduced in women on ET, while this risk was increased by 5 years in women on cHT. Use of cHT was also associated with an increased risk of cardiovascular disease and stroke in older women, but a reduced risk of colon cancer. As with all therapies, women should be fully informed of the risks and benefits of their particular HT regimen, be reviewed annually, and therapy should be individualized. The optimal dose of HT required to prevent bone loss may vary from woman to woman. With any therapy for osteoporosis, repeat bone density should be considered after 2 years to check the therapeutic regimen is efficacious.



Tibolone

Tibolone is an alternative to oestrogen therapy and its effect on BMD appears to be similar and studies on spinal fractures are ongoing. The effect of tibolone on breast cancer is uncertain.

Calcium

Calcium is important for osteoporosis prevention because it can decrease bone turnover and slow bone loss. Calcium needs grow as women reach menopause because the ability to efficiently utilize dietary calcium decreases as a result of declining ovarian estrogen production. In addition, calcium increases the effect of exercise on bone mineral density (BMD) in postmenopausal women. Although women can benefit from calcium at any age, the benefits of calcium on BMD are most pronounced in women five or more years past menopause.

The recommended daily calcium intake for postmenopausal women is between 1000 mg and 1500 mg. This can be obtained from about 3-4 serves of dairy products per day.

Dairy products (e.g., milk, cheese, and yogurt) are the most common sources of dietary calcium. Calcium-fortified foods (e.g., orange juice, cereals, and nutrition bars) are another option.

For example, each of the following contains about 300-350mg of calcium:

- one glass (250mL) of milk;
- two slices (40g) of cheddar cheese; or,
- one tub (200g) of yoghurt.

For those who are unable to tolerate dairy products, calcium enriched soy milk, tinned fish with bones and fortified breakfast cereals are good sources of calcium. Also, a large variety of supplements are currently available from pharmacies and health food stores.

The two most common calcium supplements are calcium carbonate and calcium citrate. Calcium phosphate and calcium gluconate are also available. Calcium carbonate contains 40% elemental calcium, the highest amount available among calcium formulations; it should be taken with food to maximize absorption by providing an acidic environment. Calcium citrate may be taken

with or without food, but it is more expensive, contains less elemental calcium (21%), and is available in fewer formulations. Labels of calcium supplements should be evaluated to determine the amount of elemental calcium per dos.

Exceeding the recommended daily calcium intake offers no health benefit and may be harmful. Calcium absorption can be affected by several factors. Absorption is decreased by dietary fiber, fiber laxatives, and antacids. Conversely, calcium can decrease the absorption of iron and some medications. When taken with food, calcium carbonate and calcium citrate are equally well absorbed. The most common adverse effects of calcium are constipation, bloating, cramps, and gas.

Vitamin D

Vitamin D is produced in the skin as a result of sunlight exposure and is necessary for adequate calcium absorption. About 15 minutes of incidental sunlight five times a week is usually sufficient for the body to generate vitamin D. Times of peak ultraviolet light exposure, between 10am and 3pm should be avoided. However, in the southern regions of Australia where winter sunlight is weak vitamin D supplementation may be beneficial.

In addition, certain individuals including housebound and older women in residential care facilities and dark skinned or veiled women are at risk of deficiency.

Vitamin D is available in Australia as ergocalciferol (Ostelin 1000 IU per capsule) or cod liver oil tablets (approximately 400 IU). Smaller amounts of vitamin D are also contained in some calcium and vitamin supplements (eg. Caltrate + D contains 200 IU per tablet). Supplements are beneficial for preventing vitamin D deficiency in individuals with a poor diet or limited sunlight exposure.

Calcitriol

Calcitriol should not be used in the treatment of vitamin D deficiency. Calcitriol is available on the PBS for the treatment of postmenopausal osteoporosis in Australia. It should not be used as sole therapy and serum calcium levels require monitoring on this drug.

Parathyroid hormone (PTH)

Daily PTH injections are a new treatment for osteoporosis and the first to result in new bone formation over an 18-month course of treatment. PTH is a treatment option for individuals with extremely low bone density or severe osteoporosis with ongoing fractures who have failed other therapies, however, it is not on the PBS and is very expensive.

Strontium ranelate

This agent is currently unavailable in Australia. Studies published to date have shown it decreases spinal fractures.

Thiazide

Thiazides are a type of fluid tablet that act on the kidney to reduce the excretion of calcium in the urine. In studies the use of thiazides is associated with a reduced risk of hip fracture in men

and women. The effect of thiazides on bone density in patients with normal blood pressure is now being studied.

Combination therapy

The role of combination therapy is unclear. Parathyroid hormone injections should not be given at the same time as alendronate, as this will reduce the effectiveness of PTH. Alternatively, the effects of alendronate and raloxifene on bone density are additive.



Preventing osteoporosis

Although medication may be required for some people, it is important to:

- maximise peak bone density in childhood & adolescence; and
- maintain bone density throughout adult life.
- ensure a diet with adequate calcium and participate in regular weight bearing high impact, and/or strengthening exercise in children and adolescents.
- exercise in premenopausal women should include resistance training to improve muscle mass, strength and balance, as well as regular weight bearing high impact, and/or strengthening exercises.
- exercise in postmenopausal women should include resistance training to improve muscle mass, strength and balance, as well as specific balance training which should be performed three times per week.
- maintain good general nutrition and adequate vitamin D especially in the elderly; and
- avoid tobacco use.

Conclusion

The management of postmenopausal osteoporosis should be based on an individual risk/benefit analysis, age and time since menopause, presence or absence of oestrogen withdrawal symptoms, history of fractures after minor falls or accidents, and other medical conditions.

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