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## **OSTEOPOROSIS - a patient's guide**

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### **Overview**

It is an important condition that causes much suffering as it leads to fractured bones

It is more common in women, but also occurs increasingly with age in men as well.

The lifetime risk of a fracture in a 50 year old woman is approximately 30-40%

The best strategy is prevention, by ensuring peak bone mass is achieved in young adulthood

Lifestyle measures are effective in preserving bone mass

Oestrogen replacement is beneficial in greatly reducing bone loss and fractures after menopause

### **What is it?**

Osteoporosis is a disorder of the skeleton characterised by reduced density of bone, and changes in the microscopic architecture of the bone, leading to bone fragility and susceptibility to fracture. It may also be defined statistically in terms of Bone Mineral density (BMD), as a BMD more than 2.5 Standard Deviations below the peak value in young adults.

Women in the lowest quarter of bone density, have a 12-fold increased risk of hip fracture.

This definition requires a measurement of BMD. BMD is usually measured with a dual energy x-ray absorptiometer (DEXA) machine at several sites, including the lumbar spine and the femoral neck. Bone density can also be measured by CT scanning and, indirectly, by ultrasound.

Most women at increased risk of osteoporosis can be identified by clinical risk factors, and this is a reasonable approach to diagnosis in the absence of readily affordable and available bone density measurements.

Reduced BMD occurs because bone absorption increases, or new bone formation decreases. Usually these two processes are in a dynamic balance, but alteration on either side of the balance can result in osteoporosis.

The greatest problem for sufferers from osteoporosis is the risk of fractures. These fractures typically occur with minor falls (low trauma fractures), and most commonly involve the spine (vertebral fractures), hip (neck of femur fractures) and the wrist. The combination of osteoporosis and falls (with their own causes) results in fractures.

### **Risk factors for osteoporosis:**

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Older age, especially older women

Early menopause

Smoking

Physical inactivity

Thin body

Low calcium in diet

Excess alcohol

Family history of osteoporosis

Certain drugs (prednisone, phenytoin, thyroxine, heparin)

Endocrine ("gland") diseases: hyperparathyroidism, thyrotoxicosis, Cushing's syndrome.

Rheumatic diseases such as rheumatoid arthritis

Haematological disease such as multiple myeloma

All these risk factors contribute to osteoporosis.

**The greatest risks for fractures in osteoporotic patients are:**

Women with low body weight (<58kg)

Smokers

First degree relative with a low trauma fracture

Previous low trauma fracture

**What can be done about it?**

It is important to maintain physical activity (if possible), have plenty of calcium in the diet, and to get modest amounts of sun exposure, which stimulates vitamin D production.

**Specific therapies include:**

Hormone replacement therapy

Bisphosphonates

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Calcium and vitamin D

Calcitonin

Fluoride

Thiazide diuretics

Some of these therapies have been shown to be effective irrespective of age.

### **Hormone replacement therapy (HRT):**

This is probably the most effective therapy for osteoporosis for preventing bone loss in the early and late menopause.

Current use of HRT, particularly long term use is associated with a 30-50% reduction of hip spine and wrist fractures. Use of HRT in the past does not give ongoing protection, therefore to give protection against hip fracture, it would need to be given to women in their 60 s and possibly 70's.

The oestrogen hormone component is effective in increasing BMD (bone density). The lowest dose of oestrogen that will protect against fractures has not been exactly determined.

Female hormones are only suitable for women.

In cases of male osteoporosis, male hormones (androgens) have been used with success.

Oestrogen must be combined with progesterone hormones when given to women who still have a uterus, to reduce the risk of uterine cancer. Where the person has a history of breast cancer, or a family history of breast cancer, HRT is usually contraindicated. Some women find HRT unacceptable, because of the low risk of inducing uterine bleeding, as well as the side effects of nausea and breast tenderness.

### **Bisphosphonates:**

Etidronate has been available in New Zealand for a number of years. It needs to be given on an empty stomach in a cyclical pattern alternating with calcium tablets (2 weeks etidronate followed by 10 weeks calcium). For some patients this may be difficult to follow. It can cause nausea and inflammation of the oesophagus. However, after HRT, it is probably the most effective treatment for osteoporosis.

Alendronate (Fosamax) has recently become available in New Zealand. This bisphosphonate is more effective than etidronate, and is better absorbed orally. It can cause similar side effects to etidronate. It is taken daily, and a complicated course alternating with calcium is not required. In fact, calcium ingestion at the time of taking the tablets should be avoided, as this reduces the absorption. At the time of writing, Pharmac in New Zealand (the drug

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subsidy control body) does not yet subsidize it for the treatment of osteoporosis, although it is anticipated that this will change soon.

Pamidronate is an intravenous form of bisphosphonate, which is not used for the treatment of osteoporosis.

### **Calcium and Vitamin D:**

A good calcium intake (>1gm/day) helps to slow the rate of reduction in BMD. In the frequent cases where dietary intake of calcium is insufficient, oral tablets can be used.

In all cases of Vitamin D deficiency (a condition called osteomalacia, closely related to osteoporosis but not the same), Vitamin D (calciferol) should be replaced. Modest sun exposure, a large single dose of Vitamin D (which is sometimes difficult to obtain in New Zealand), or daily vitamin tablets containing Vitamin D (e.g. Multivit 6) can achieve this.

An activated form of vitamin D is also available for the treatment of osteoporosis. This is called calcitriol (Rocaltrol). It is probably effective in treating osteoporosis, particularly when combined with other agents. It also may have a role in preventing osteoporosis, particularly prednisone induced bone loss, The tablet regimen is simple, but the blood calcium needs to be monitored periodically.

### **Calcitonin:**

Calcitonin has been used in the USA for the treatment of osteoporosis. It does increase BMD, but has not been shown clearly to reduce fractures. It has required subcutaneous injections in the past, but intranasal forms have now been developed. It cannot be given to patients who are allergic to salmon. It is available in New Zealand, but it is very expensive.

### **Fluoride:**

Fluoride increases BMD. However, there are concerns that it makes bones more brittle. The drug is often poorly tolerated because of side effects. It is not routinely recommended for the treatment of osteoporosis.

### **Thiazide diuretics:**

These agents reduce BMD deterioration by increasing calcium reabsorption by the kidney. They are not often used to treat osteoporosis, but this effect can be beneficial when they are used for other reasons (e.g. treating high blood pressure), particularly in older patients.

### **Prevention**

A more effective strategy is to prevent osteoporosis. This can be achieved by encouraging a good calcium intake around puberty and for young adults, and encouraging exercise. There is good evidence that achieving maximum BMD by these means helps prevent osteoporosis in later life. Not smoking, good nutrition and avoiding excess alcohol all help to prevent osteoporosis.

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### **Future trends**

Strategies to increase BMD and reduce falls are being developed. This is vitally important as it is the combination of osteoporosis and falls that causes so much distressing fractures, especially in the elderly. A large number of drugs are being developed. In particular, the newer bisphosphonates are encouraging, and different mechanisms of administering HRT are being developed.

A class of drugs that is showing encouraging results are the SERMS (selective estrogen modulators). These drugs include Tamoxifene, used for the treatment of breast cancer, and Raloxifene. Parathyroid Hormone Related Peptides (molecules that consist of part of the Parathyroid Hormone molecule) are currently under study.