

**OSTEOPOROSIS**



*"Truth and Remorse"*, detail from "The Calumny of Apelles", Tempera on wood, Sandro Botticelli 1495, Galleria degli Uffizi Florence.

*In Botticelli's "The Calumny of Apelles", we see to the far left the detail of the allegorical figures of "Truth and Remorse". Remorse is shown as an old crone, bent over with age. She looks back remorsefully at her lost youth as depicted by "Truth". Truth is a naked beauty. It is like the innocent youth, almost naked with nothing to conceal. In stark contrast is the bitter bent over figure, ravaged by the relentless passage of time, carrying the "baggage" of her many years, perhaps now with very much to hide! Perhaps she wonders what she would have done differently if only she could have her time over again.*



*Many great art works of the Fifteenth and Sixteenth Centuries carry the leitmotif of the alarming contrast of vigorous youth with the reaper of old age and death. Many show the imagery even more vividly than Botticelli, the image of death holding an hourglass which has finally run out.*

*In the modern world of 21<sup>st</sup> century, we are still faced with the ravages of old age.*

*A range of degenerative diseases relentlessly destroy our bodies. Osteoporosis in particular bends us over and transforms us into mere shadows of our former "truth". Humanity continues its never ending search for the fountain of youth. We struggle with preventative strategies to slow down the passage of the sands through the hour glass. One important strategy we do have is the prevention of osteoporosis. By careful attention to the risk factors for this disease, we may perhaps look back at our lost youth in not quite such a bent and degraded state!*

*"The Three Ages and Death", oil on panel, Hans Baldung, 1539, Museo del Prado Madrid.*

## **OSTEOPOROSIS**

### **Introduction**

Osteoporosis is a systemic condition characterized by:

- Low bone mass.
- Deterioration in the microarchitecture of bone (bone quality).

These two factors lead to increased bone fragility and a consequent increase in fracture risk.

The major relevance to the Emergency Department is the presentation of patients with low-trauma mechanism fractures.

It is important to have an understanding of a patient's T and Z scores to assist in the *risk assessment* of a patient for low-trauma mechanism fractures.

About 50% of women can expect to sustain fractures in their lifetime.

In men, osteoporosis has been a neglected public health issue; however, low-trauma fractures due to osteoporosis occur in 30% of older men, and one-third of all hip fractures in the community occur in men

### **Osteoporosis is an important and costly public health problem.**

### **Pathology**

Osteoporosis is a systemic condition characterized by:

- Low bone mass.
- Deterioration in the microarchitecture of bone (bone quality).

These two factors lead to increased bone fragility and a consequent increase in fracture risk.

The commonest fracture sites include:

- Vertebral bodies, (significant height can be lost in old age)
- Hip
- Wrist

### Risk factors

A wide range of risk factors have been identified for osteoporosis:

1. Constitutional factors:

- Female sex
- Post menopause, (estrogen deficiency)
- Ageing
- Family history of osteoporosis

2. Systemic diseases:

- Endocrine disorders:
  - ♥ Sex hormone deficiency in men and women
  - ♥ Cushing syndrome
  - ♥ Hyperthyroidism
  - ♥ Hyperparathyroidism
- Gastrointestinal:
  - ♥ Malabsorption syndromes
  - ♥ Coeliac disease
  - ♥ Gastric/bowel resection
- Chronic medical conditions in general (eg liver, renal, cardiopulmonary diseases)
- Anorexia nervosa
- Rheumatoid arthritis and other connective tissue diseases

3. Drugs:

Many have been implicated, but in particular:

- Glucocorticoids.

- Excessive thyroid hormone
- Long-term heparin

4. Lifestyle factors:

- Smoking
- Excessive alcohol
- Physical inactivity
- Immobilisation

5. Nutritional factors:

- Low calcium intake
- Lack of vitamin D

### **Clinical features**

The diagnosis of osteoporosis may be known, but if this has not already been made, its presence may be suspected on the nature of:

- The presenting fracture and its mechanism
- Bone lucency on plain radiographs, (late)
- The presence of old vertebral fractures.
- Risk profile of the patient

### **Investigations**

#### **Plain radiography**

Plain radiography is not as sensitive as BMD testing, (see below).

Approximately 30-80% of bone mineral must be lost before **radiographic lucency** becomes apparent on plain radiographs.

#### **T Scores and Z Scores**

**Bone mass** is generally *measured* as bone **mineral density** (BMD).

The lower the BMD, the higher the risk of fracture.

Bone mineral density is best measured by **dual energy X-ray absorptiometry (DXA)** in a facility with a high standard of quality control.

The bone mineral density (BMD) **T-score** is the number of standard deviations away from the mean BMD of an adult aged 30 years.

The **Z-score** is the number of standard deviations away from the age- and sex-matched mean BMD.

Osteoporosis is diagnosed (according to World Health Organization criteria) when BMD at any major skeletal site is 2.5 or more standard deviations **below** the mean for normal people aged 30 years (ie a T-score of -2.5 or lower).

This means that **osteoporosis** can be diagnosed before minimal trauma fractures have occurred.

A lesser bone deficit, **osteopenia** or low bone mass, is defined by a T-score between -1 and -2.5, while a T-score of -1 or higher is normal.

Originally T scores were developed to assess postmenopausal women older than 50 years, but now they are also used for men.

Z scores are used to assess patients younger than 50 years. A low Z-score (less than -2) should prompt investigation for underlying causes of a bone deficit.

T-score	Interpretation
-1 or higher	Normal
between -1 and -2.5	Osteopenia
-2.5 or lower	Osteoporosis

## Management

Medical management for osteoporosis includes:

1. Calcium and vitamin D supplementation.
  - Calcium supplementation can reduce the rate of bone loss and it may reduce fracture rates.
2. Specific treatment:

Pharmacotherapy for osteoporosis can be divided into drugs that are:

- **Anticatabolic:**
  - ♥ Bisphosphonates

- ♥ Selective oestrogen receptor modulators (eg raloxifene)
- ♥ Oestrogen/progestin hormone therapy
- ♥ Strontium ranelate
- **Drugs that are anabolic**
- ♥ Parathyroid hormone

**See latest Endocrine Therapeutic Guidelines for full prescribing details.**

Osteoporosis however is not managed in the ED.

The major issues in the ED will relate to:

- The management of complicating fractures.
- Risk assessment when considering disposition plans.

#### *The management of complicating fractures*

Some degree of trauma plays an important role in most fractures, although bone fragility alone can cause vertebral fractures.

Any patient sustaining a fracture after low-energy trauma (eg a simple fall) should be assessed for its cause and most commonly this will be osteoporosis.

Older patients who have sustained a fracture, particularly if a low energy mechanism is involved, should be assessed for osteoporosis as the underlying predisposition for the injury.

This is done by:

- Assessment of the radiograph itself, for signs of osteoporosis, (as above). This is a rough guide only however, as osteoporosis must be relatively advanced before it is detectable on plain radiography.
- Assessment of the risk profile of the patient for osteoporosis, (as above)

#### *Risk assessment*

Issues of patient safety are important in the elderly with advanced osteoporosis.

When planning discharge from the ED, for these patients, consideration needs to be given to the fact that they are at high risk for significant injury from fractures.

Depending on the nature of the presentation, an additional assessment by a care coordinator and/ or physiotherapist may therefore be useful before discharging a patient home.

Assessment is made regarding:

- Home supervision
- Ability to cope at home
- Support services
- Mobility and safety for discharge
- The propensity for falls

*Referral and Education resources for patients*

- Dietitian referral
- Endocrinology referral

*General information:*

[www.osteoporosis.org.au/](http://www.osteoporosis.org.au/)

*References*

1. Endocrinology Therapeutic Guidelines 4<sup>th</sup> ed 2009

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