Osteoporosis

Understanding osteoporosis

Osteoporosis is a serious health problem facing many aging populations all over the world. Although predominantly a disease affecting women, about 15% of vertebral fractures and about 20% of hip fractures occur in men. At least half of all postmenopausal women will experience fractures during their lifetime and by the age of 90 years, 75% of women will have experienced a vertebral (spinal) fracture.

Unfortunately, many women with osteoporosis are not aware that they have the disease and do not receive any treatment. The consequences of osteoporosis (i.e. a fracture) are associated with long-term pain and disability, disfigurement and increased mortality. Osteoporosis should be regarded as seriously as other important chronic conditions such as hypertension and dyslipidaemia since the disease constitutes a major cause of disability, mortality and economic burden.

It is important, therefore, to identify women at risk of the disease and to implement preventative and effective treatments that will reduce the incidence of osteoporotic fractures.

- **What is osteoporosis?**
  Osteoporosis may be defined as a progressive systemic skeletal disease characterised by low bone mass and the micro-architectural deterioration of bone which results in an increase in bone fragility and susceptibility to fracture. In other words, osteoporosis is defined in terms of both low bone mass and changes in the quality of bone, which increase the chance of a fracture. Nonetheless, other factors are also important in the incidence of fractures, such as the likelihood of a fall. In some patients these factors may even be a more important predictor of a fracture than the bone density.

Ask patients with osteoporosis about the medicines that they are taking. It is best for these patients to avoid medicines that may affect vision or cause dizziness, vertigo or drowsiness as these side effects may increase the risk of the patient falling, especially if the patient is elderly.

- **Risk factors for osteoporosis**
  The single most important risk factor for an osteoporosis-related fracture is menopause. This is because the lack of oestrogen after menopause increases the rate of bone loss. Other risk factors for the development of osteoporosis include:

  - Female gender
  - Early menopause (before age 45 years) or prolonged premenopausal amenorrhoea (no periods for more than a year in a premenopausal non-pregnant female)
  - Personal history of fracture as an adult
  - History of fracture in a first-degree relative
  - Low body weight (less than 58 kg)
  - Smoking
  - White race
  - Advanced age
  - Lifelong low calcium intake
  - Alcohol intake more than 3 units per day (one unit = a glass of wine, a single tot of spirits)
  - Inadequate physical activity
  - Long-term use of corticosteroids

These risk factors, taken together, are highly predictive of future fracture in women.

- **Screening for and diagnosing osteoporosis**
  Measuring the bone mineral density (BMD) is the most common method of screening for osteoporosis. The rationale for using BMD to identify patients at risk of an osteoporosis-related fracture comes from studies that have shown a relationship between low bone density and fracture risk. However, a single measurement indicates only current BMD and not the anticipated rate of bone loss. Other factors may be more important in predicting the risk of fracture than BMD. For example, fall-related factors may be more important in predicting hip fracture than BMD because most hip fractures result from falls.

For the purpose of making a diagnosis of osteoporosis, the individual’s bone mineral density is compared with that of a healthy young adult woman. This comparison is made by means of standard deviation units (T-scores). A T-score of -2.5 or less establishes a diagnosis of osteoporosis.

However, the value of the T-score alone should not be used as the deciding factor on whether or not to implement treatment as many other risk factors, besides the bone mineral density, have an impact on the individual patient’s risk of an osteoporosis-related fracture.

**Understanding fracture risk**

Bone constantly undergoes remodelling to repair and replace existing bone tissue. During the growing years, more bone is laid down in the skeleton than is lost and the bone mineral density increases until the peak bone mass is achieved in the third decade of life. Thereafter, more bone is lost than is laid-down in the skeleton and an age-related decline in bone mass occurs. The decline is accelerated in women after the menopause because oestrogen in women plays an important role in the remodelling of bone. This fact together with the lower peak bone mass achieved in women partly explains the higher incidence of osteoporosis in women when compared to men.
The progressive bone loss and deterioration of bone quality increases the fragility of bones and makes them more susceptible to fracture. Most fractures that are not caused by severe trauma occur in patients with osteoporosis. A low trauma fracture (following a fall from standing height or less) should trigger the suspicion of osteoporosis.

Osteoporosis is associated with an increased risk of fracture at most skeletal sites but classical fracture sites include the wrist, spine, hip, ribs, pelvis and humerus. Although most fractures due to osteoporosis present clinically, spinal fractures may be asymptomatic in as many as two-thirds of patients.

Hip fracture is the most serious consequence of osteoporosis and is quite common in older women. Hip fractures are associated with a 20% mortality within one year, while 50% of hip fracture survivors never regain the ability to lead an independent life. More than 90% of hip fractures are associated with a fall and therefore, the prevention of falls is an essential factor in preventing hip fracture.

Non-pharmacological options to prevent hip fractures include the use of hip protectors.

Although osteoporosis indicates a high likelihood of fracture, many fragility fractures occur in people with a bone mineral density above the defined diagnostic (i.e. -2.5) level. Fractures can be better predicted by adding the patient’s other risk factors that contribute to fracture risk independently of the bone mineral density. See risk factors for osteoporosis.

Managing osteoporosis

- **Lifestyle strategies for bone health**
  - Primary prevention strategies that may be implemented on a population-wide basis should emphasise the modification of lifestyle to ensure better bone health.
  - Advice relating to the following lifestyle issues can increase the public awareness of the risk of osteoporosis and its prevention:
    - Stop smoking - Smoking is a risk factor not only for heart disease and lung cancer but also for osteoporosis.
    - Limit alcohol consumption.
    - Take part in weight-bearing exercise (e.g. brisk walking) for at least 30 minutes on most days of the week.
    - Ensure an adequate intake of calcium and vitamin D, which can result in a positive calcium balance and a reduction in the rate of bone loss. Although the most definitive role for calcium is to ensure bone health, adequate calcium intake has been shown to reduce bone loss in women during and after menopause and to reduce fractures in post-menopausal women older than 60 years with low calcium intakes.

**Supplementation with calcium and vitamin D**

- An adequate intake of calcium is considered a key component of any bone-protective treatment regimen.
- The target calcium intake for most postmenopausal women is 1200 mg of elemental calcium per day.
- The recommended calcium intake is 1000 mg for premenopausal women aged 25 to 50 years.
- Although the best source of calcium is food, particularly from dairy products, high-quality calcium supplements taken in divided doses are alternative sources for women unable to consume enough dietary calcium.
- Approximately three cups of dairy products provide the 1200 mg target.
- Calcium supplementation should be recommended in those patients whose diet is unlikely to reach this target. (Most Western diets contain about 400 to 600 mg of calcium daily.)
- If calcium supplementation is needed, each dose must not exceed the age-appropriate allowance and should be consumed with a large glass of water.
- An adequate vitamin D status is required to achieve the nutritional benefits of calcium.
- Sources of vitamin D include sunlight exposure, vitamin D fortified foods and oily fish such as salmon or mackerel.
- The vitamin D intake in patients who do not have an adequate vitamin D status (e.g. the elderly patient, especially if confined indoors) may be supplemented with an oral intake of 400 to 800 IU of vitamin D. The upper safe limit of vitamin D daily is 2000 IU.

However, it is important to emphasise that calcium and vitamin D supplementation by itself is not enough to ensure optimal bone health and patient’s need to address other lifestyle issues, as discussed above, in order to achieve their optimum bone health.

- **Reduce falls, reduce fractures**
  - Falls have an important role in fractures, particularly in elderly or frail people. There are many medicines that may increase the risk of falling (e.g. sleeping tablets, anxiolytics, antidepressants, classical anti-histamines, blood pressure medicines) which because of their side effect profile may increase the risk of a fall. Changes to the home environment (e.g. no stairs, uneven surfaces etc.) may also help in reducing the likelihood of a fall.

- **Medicines for osteoporosis**
  - Postmenopausal women with osteoporosis or at high risk for fracture from osteoporosis should be considered for pharmacotherapy. Particular attention should be paid to treating women with a recent fracture, because these women are at high risk of a second fracture.
  - Medicines used in the treatment and prevention of osteoporosis include the bisphosphonates such as alendronate (e.g. Fosamax®), strontium ranelate (e.g. Protos®), a selective oestrogen receptor modulator such as raloxifene (e.g. Evista®), oestrogens (e.g. hormone therapy regimens used alone or in combination with a progesterone hormone), calcitonin (e.g. Miacalcic®) and vitamin D (e.g. Rocaltrol®).

Patient compliance and persistence with osteoporosis treatments need to be improved. Possible approaches that allied health professionals can use include better patient education while physicians can look to regimens that improve patient adherence to treatment in the long-term and thereby avoiding the occurrence of the osteoporosis-related fracture.

### References:

1. Rosen HN, Basow DS. Screening for osteoporosis. Uptodate.com 2003