Osteoporosis in the very old

Osteoporosis is a common but underdiagnosed and undertreated condition in very old patients. The deformity, morbidity and loss of independence experienced after an osteoporotic fracture is a major health concern in this population.

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Osteoporosis is characterised by low bone mass and microarchitectural deterioration of bone tissue, which leads to enhanced bone fragility and a consequent increase in fracture risk.[1] The prevalence increases with age in both sexes but the condition is more common in women, particularly after menopause. It is an important clinical and public health issue because of the morbidity and mortality associated with osteoporotic fractures.

Older people are a heterogenous group in regard to their health status and the extent of their disability, and there is no precise chronological age that defines 'the very old'. For the purpose of this review, the term will refer to frail older people who, regardless of age, demonstrate the manifestations of multiple chronic diseases with accompanying high rates of disability (see Table 1). People in this group are often resident in aged care facilities, although the majority still live in noninstitutional settings.

Burden of the problem

According to a survey conducted by Access Economics, 1.9 million Australians suffered from osteoporosis including osteoporotic fractures in 2001, and the associated costs in 2000–2001 were estimated to be nearly $7.5 billion.[2] It was projected that 50% of women and more than 30% of men aged over 60 years will sustain an osteoporotic fracture – the most common type will be a vertebral fracture, many of which will be asymptomatic.

The occurrence of all osteoporotic fractures is heavily age dependent, meaning that they become progressively more common in older age even after allowing for the accompanying lower bone density. Examples are shown in Figures 1 and 2. Fractures of the long bones and pelvis are common, and are associated with acute and long term problems. Hip fractures are the most serious type, in both personal and community costs: 50%

IN SUMMARY

- **Osteoporosis is a common chronic bone disorder signifying bone failure. It frequently manifests as fragility or minimal trauma fractures.**
- **Osteoporosis is underdiagnosed and undertreated in the very old, particularly in the most frail. Chronological age alone should not disqualify very old patients from treatment.**
- **Many older people will be diagnosed with osteoporosis after a fracture has occurred. The recovery phase is an ideal time to consider the diagnosis as well as strategies for preventing fractures in future.**
- **Recognition of risk factors for osteoporosis and falls should help identify the most appropriate intervention for individual patients.**
- **Specific pharmacotherapy for osteoporosis in very old patients includes calcium and vitamin D supplements, bisphosphonates and raloxifene. Lifestyle factors should be addressed in all patients.**

Table 1. Characteristics of the very old

Multiple chronic diseases
High rates of disability
Impaired physiological reserve
Use of multiple medications (often)
Residency in aged care facilities (possibly)

Table 2. Risk factors for osteoporosis

Nonmodifiable

Increasing age
Female sex
Caucasian race
Family history of osteoporosis or minimal trauma fractures
Prior minimal trauma fracture

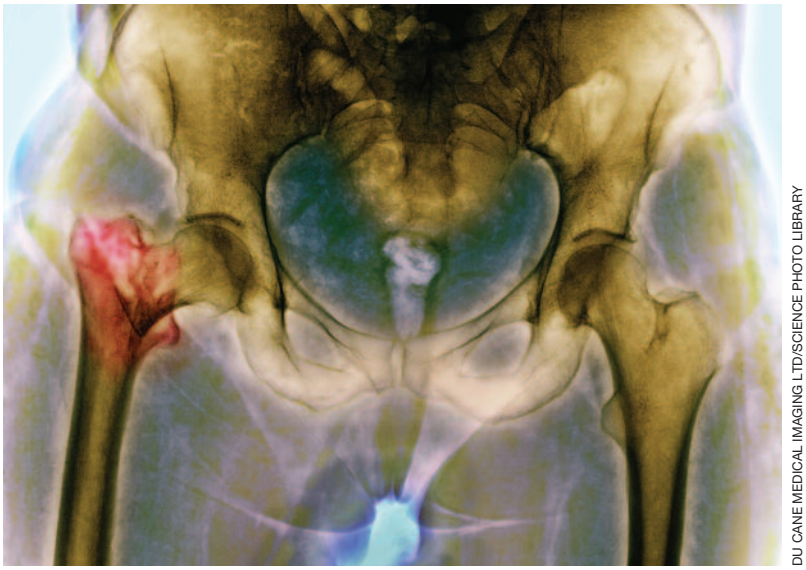
Modifiable

Low body mass index
Lack of physical activity
Poor nutrition (low calcium intake)
Vitamin D deficiency
Smoking

of patients require long term nursing care and more than 20% die within six months.[2] These figures are well above the expected values of an age-matched population. About one-third of patients sustaining hip fractures are resident in aged care facilities;[3] the median age of women who suffer this type of fracture is about 80 years. Overall, fractures are common in old age and are often associated with long term sequelae.

Risk factors

The classification of risk factors for osteoporosis as modifiable or nonmodifiable, as shown in Table 2, is useful in diagnosing and managing all patients, including older ones.[4] To have the greatest potential benefit, investigation and treatment strategies for osteoporosis should be targeted to those at highest risk of fracture. Older people are more likely to have several risk factors for fracture (including previous fractures), and number needed to treat analyses suggest that they are likely to derive greater benefit per year of antiosteoporotic treatment than younger people.[5] The highest risk candidate for osteoporosis would be a frail older Caucasian woman in a residential care



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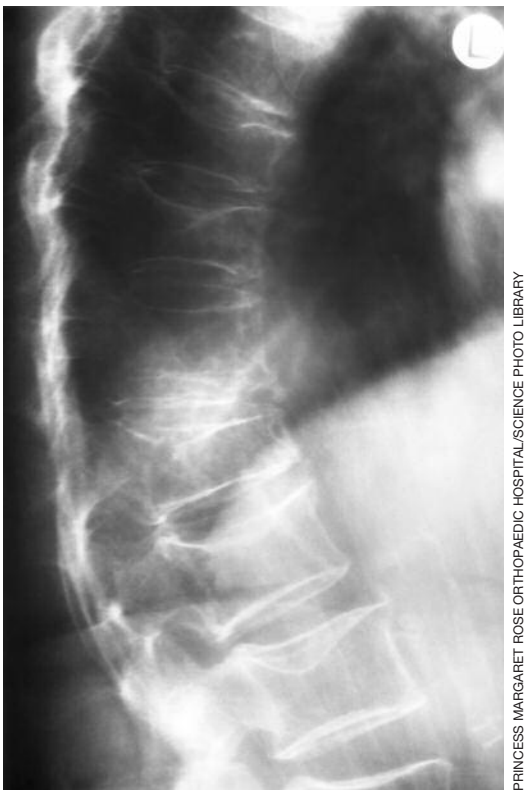

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Figure 1 (above). A fractured femur in an elderly woman caused by a fall.

Figure 2 (left). An osteoporotic vertebral fracture. Marked kyphosis is visible.

Table 3. Osteoporosis: routine investigations

- Electrolytes, urea and creatinine
- Liver function tests
- Serum calcium and phosphate (PTH should be checked if calcium is raised)
- Full blood count
- Serum 25-hydroxy vitamin D
- Thyroid function tests
- Lateral thoracolumbar spine x-ray
- Plasma and urine quantitative electrophoresis (if fracture related to multiple myeloma is suspected)

environment (or at risk of entering one), with previous minimal trauma fractures, reduced physical activity, inadequate nutrition and vitamin D deficiency.

With increasing age, people are more likely to suffer other medical illnesses or to receive medications, some of which can markedly increase their risk of osteoporosis. These include rheumatoid arthritis, hyperparathyroidism and malabsorption syndromes, and long term corticosteroid therapy. Chronic respiratory disorders are frequently complicated by long term corticosteroid use and restricted mobility, which markedly increase the incidence of osteoporotic fracture. Likewise, any degenerative condition associated with impaired mobility will increase not only the risk of lower bone mineral density (BMD), but also that of falls.

Diagnosis

The diagnosis of osteoporosis is often straightforward in this population because patients commonly present after sustaining a fracture with minimal trauma. Effort should be made to assess the risk of future fractures and to identify any remediable risk factors.

History and examination

Features in the patient's history that raise suspicion of fracture risk (osteoporosis and falls) should be addressed together. These include back pain, loss of height, falls and prior minimal trauma fracture. The patient's general medical history and use of medications – both current and past – should be considered, remembering that sedatives and antidepressants may increase the risk of falls markedly.

On examination, the following should be looked for:

- impaired gait and balance
- kyphosis
- low body mass index (BMI)
- postural hypotension
- evidence of long term or high dose corticosteroid therapy.

Investigations

Routine investigations used in assessment are listed in Table 3. Focal pathology resulting in localised bone fragility and fracture (such as tumour metastasis and multiple myeloma) should be excluded.

Dual energy x-ray absorbiometry (DEXA) is a useful tool for diagnosing and monitoring osteoporosis.[6] BMD is predictive of fracture risk, and DEXA is currently the gold standard for measuring it at the hip and lumbar spine (osteoporosis is defined as a T-score of less than –2.5). Ultrasound scans may be useful in the future, but there is less clinical experience in their use.

Reviewers' comments

GPs will rightfully question whether any osteoporosis specific drug that makes a small difference to bone strength will really make much difference to a frail older patient who falls often. The truth is we do not have 'definitive proof' as no clinical trial to date with fractures as the main outcome have specifically targeted this group of patients (apart from the vitamin D studies). The treatment of osteoporosis as suggested by this review, however, offers the best advice based on current evidence on the right approach to take to older patients. It is important for GPs to have access to reviews on common 'ageing diseases' such as osteoporosis written by experts in the care of older patients, as the approach to frail older patients is not the same as it would be for younger 'fitter' patients. In the frail elderly, prevention of falls is important if fractures are to be prevented. It is just as important to start medications to improve bone strength as it is to stop drugs that cause falls (e.g. psychotropic drugs). The elderly are more likely to have adverse reactions to medications and in the case of bisphosphonates find it more difficult to comply with the method of taking them. Some patients will feel worse on the medications, and it is important to bear in mind that stopping the medication has at worst only increased the risk of future fracture to a small degree for the individual patient.

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This is a very timely article in the light of the projected increase in the number of elderly patients in the population over the next 25 years – 27% of Australians will then be over the age of 60 years. This corresponds to a greater than 102% increase in population ageing between 1996 and 2025. Individual life expectancy is also projected to increase during this period, as is, therefore, the potential for increased incidence and prevalence of osteoporotic fractures. There is great scope with modern treatment to mitigate the impending epidemic.

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Plain x-rays do not reliably exclude osteoporosis[4] – at best, they can suggest osteopenia and be used to document the presence of vertebral fractures. Biochemical markers of bone turnover have been used to help gauge the risk of future fracture and monitor treatment of osteoporosis, but such tests are rarely required in this population.

Why is osteoporosis in the very old undertreated?

The rate of initiation of adequate therapy for osteoporosis is low, even after one or more minimal trauma fractures.[7] This 'therapeutic nihilism', frequently referred to as missed opportunities for secondary prevention, is poorly explained but probably reflects failure of the medical community to associate such fractures with underlying osteoporosis and inadequate recognition of other risk factors for osteoporosis and falls. In addition, there is prescriber ignorance of the relative safety and effectiveness of treatments available on the Pharmaceutical Benefits Scheme (PBS), as well as poor patient and carer knowledge (and hence interest) regarding the use of additional medications on top of what is probably already a long list of other medications. Also, vitamin D supplements may be considered expensive.

Many older people will be diagnosed after a fracture has already occurred. The fact that many older people who sustain minimal trauma fractures undergo orthopaedic management and some form of rehabilitation advances the argument that treatment of underlying osteoporosis should not be ignored. The recovery phase after a fracture is an ideal time to consider the diagnosis and strategies for preventing future fractures.

Pharmacotherapy

Specific pharmacotherapy options for osteoporosis in very old patients include:

Pharmacotherapy for osteoporosis: a look at the evidence

Calcium and vitamin D supplementation

Calcium and vitamin D supplementation can be considered both risk factor management and specific treatment for osteoporosis, and should be considered for all patients. It is important to emphasise that most therapeutic trials of antiresorptive drugs have been performed on patients who either had adequate calcium intakes and vitamin D levels or had received supplements. Also, calcium and vitamin D supplementation has a specific role in frail older people.[12]

Vitamin D supplementation alone has been shown to reduce fracture rates;[13] bone strengthening and falls reduction are possible mechanisms for this effect.[14] Levels of serum 25-hydroxy vitamin D are universally low in people living in residential care, and all people with fractures in this situation should be supplemented unless contraindications are present. For frail older people not housed in residential care, it is worth checking serum 25-hydroxy vitamin D and providing a supplement if the level is low. Recent evidence would suggest that even reasonably well older people may reduce their risk of fracture with vitamin D supplementation.[15] For those people who are not vitamin D deficient, 1000 IU per day is sufficient, but older people with vitamin D deficiency should be prescribed between 3000 and 5000 IU per day for at least one month before going on routine supplementation.[16] If a patient does not have an adequate intake of dairy products (from which 60% of calcium is obtained) then a calcium supplement should be added. For women, the current recommended dietary intake for calcium is 1000 mg per day.[17] Combined supplementation has been shown to result in marked reduction in fracture rates in institutionalised older people.[12]

Bisphosphonates

Alendronate (Fosamax) and risedronate (Actonel) significantly increase BMD and reduce fracture rates at vertebral and nonvertebral sites in postmenopausal women with established osteoporosis;[18,19] a once a week formulation of each is available that simplifies dosing for many older patients. No head to head study has been conducted so there is no evidence of superiority of either drug over the other, and there is no certainty of hip fracture reduction in patients with prior hip fracture in the absence of low BMD.[8] Etidronate (Didronel) reduces the incidence of vertebral fractures but has no significant effect on nonvertebral fractures.[20]

Selective oestrogen receptor modulators

Selective oestrogen receptor modulators are nonhormonal compounds that bind strongly to the oestrogen receptor, demonstrating oestrogen agonist effects on bone but antagonist effects on the breast and endometrium. Raloxifene (Evista) has been shown to significantly increase BMD at the spine, forearm and hip, and to reduce the risk of vertebral but not nonvertebral fractures.[21]

Hormone replacement therapy (HRT)

There is now evidence from the Women's Health Initiative that HRT therapy should not be used in the long term to treat osteoporosis in postmenopausal women.[22] HRT increases BMD at all sites and, although there is an established effect on fracture reduction, there is an associated excess morbidity and mortality from cardiovascular disease and a small increase in breast cancer risk after five years of treatment. Women who are 'very old' are unlikely to have menopausal symptoms and it is now difficult to advocate long term use of HRT in this group of patients.

- calcium supplements
- vitamin D supplements
- bisphosphonates
- raloxifene.

Treatment in this population must be guided by the existing evidence (see the box on page 27), a patient's preference and capacity for compliance, the risk of adverse events and cost. Unfortunately, primary prevention of osteoporotic fractures with antiresorptive pharmacotherapy is not subsidised by the PBS, so the only approach left for many patients is calcium and vitamin D supplementation. Antiresorptive agents are subsidised for secondary prevention (i.e. treatment of osteoporosis after a proven fracture due to minimal trauma).

Clinical trials including women up to 80 years of age have shown raloxifene (Evista) and bisphosphonates to be well tolerated and to reduce fracture risk in those with osteoporosis as a main risk factor.[4,8] There are some data available for women over the age of 80 years for bisphosphonate treatment,[8] but there are no specific trials addressing efficacy in frail older people. Therefore, chronological age should not disqualify very old patients from treatment. Significant risk reduction for future fractures is apparent within 12 months of treatment with raloxifene, risedronate (Actonel) and alendronate (Fosamax),[9] so if a patient is thought likely to survive this period of time then treatment should be considered. It is never too late to prevent a painful debilitating event with long term sequelae.

A practical guide to managing osteoporosis in different types of patients is shown in the box on this page.

Barriers to optimal treatment

Adherence to dosing instructions for alendronate or risedronate is difficult for some cognitively impaired older patients. It is often possible to enlist the help of a caregiver to allow once a week dosing. Vitamin D and calcium supplements can still provide some benefit without any significant risks.

Gastro-oesophageal reflux and oesophageal dysmotility are relative contraindications to alendronate and risedronate. Given the risk of upper gastrointestinal adverse effects, oral bisphosphonate therapy is not appropriate for unsupervised people with significant cognitive impairment. The situation is similar for older people who are considered to be incapable of avoiding lying flat for 30 minutes after bisphosphonate ingestion. Two intravenous bisphosphonates, pamidronate (Aredia, Disodium Pamidronate Concentrated Injection, Pamisol) and zoledronate (Zometa) increase BMD and are available off label or in clinical trials. These are more expensive, although convenient for some older people who cannot tolerate oral alendronate or risedronate, but there is a lack of fracture outcome data to support routine use of these drugs.

Raloxifene is appropriate for some postmenopausal women with osteoporosis and vertebral fractures who are unable to take a bisphosphonate (note that a past history of venous thromboembolism is a relative contraindication to raloxifene). Life expectancy of less than one year is another barrier to treatment.

Osteoporosis: a guide to patient management

Older people without osteoporosis or previous fracture

- Routine investigations
- For housebound patients: primary prevention therapy – vitamin D supplementation, if the 25-hydroxy vitamin D level is low, and calcium, if indicated
- For all older people living in residential care: vitamin D supplementation unless contraindicated (e.g. primary hyperparathyroidism, hypercalcaemia, hypercalciuria, sarcoidosis, multiple myeloma, metabolic bone disease, active carcinoma within the last five years), and calcium, if indicated

Very old people with DEXA-proven osteoporosis but no fracture

- Routine investigations
- Vitamin D and calcium supplementation
- A bisphosphonate or raloxifene (for some women), if appropriate and affordable (these medications are not subsidised by the PBS for this indication)

Very old people with DEXA-proven osteoporosis and previous or current minimal trauma fracture

- Routine investigations
- Vitamin D and calcium supplementation
- A bisphosphonate or raloxifene (for some women), if appropriate (these medications are subsidised by the PBS for this indication)

Very old people without DEXA-proven osteoporosis but with minimal trauma fracture

- Vitamin D and calcium supplementation, which is appropriate for housebound and institutionalised patients.
- In practice, not all older patients with fragility fractures require a DEXA scan prior to antiresorptive treatment; however, treatment may be less effective in patients without reduced BMD

Monitoring of treatment efficacy

Naturally, monitoring should be individualised. Serial BMD scanning should be considered if it will influence ongoing management. For the less frail older patient who has commenced treatment on the basis of a BMD T-score showing osteoporosis (T-score below –2.5) or osteopenia (T-score between –1.0 and –2.5), reassessment may be considered. Otherwise, recurrent fractures should warrant re-evaluation for difficulties with adherence to pharmacotherapy, falls risk assessment and prevention strategies.

Other management issues

Modifiable risk factors

Modifiable factors that predispose an individual to osteoporosis or precipitate or perpetuate the condition should be targeted. Strategies include limiting glucocorticoid therapy to the shortest possible duration and lowest effective dose, and treating coexisting illnesses such as malabsorption syndromes, hyperthyroidism and hyperparathyroidism appropriately. Lifestyle factors should be addressed in all age groups.

Strategies for falls

Falls and low BMD are independent causes of fracture. The cause of falls should be evaluated with the aim of reducing their frequency and impact – if possible, this should be undertaken concurrently with osteoporosis treatment.[10] The use of hip protectors reduces the relative risk of hip fracture in institutionalised older people who are able to adhere to their application.[11]

Conclusion

In conclusion, many older patients have multiple identifiable risk factors for osteoporosis and falls (and hence fractures). Appropriate management involves attention to the risk factors and specific treatment in the context of individual patient comorbidities and estimated longevity. MT

A list of references is available from the editorial office.

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