

ABSTRACT

Osteoporosis is a global problem with a rapidly increasing incidence, and along with it, the incidence of osteoporotic fractures in the elderly is also rising. Osteoporotic fractures are of concern as it results in debilitating consequences and is a substantial burden to health care services and caregivers. Osteoporotic fractures commonly occur in the wrist, hip and spine. Understanding the management of these fractures is essential given their increasing occurrence.

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INTRODUCTION

With an increasingly ageing population, most Asian countries, including Singapore, is seeing a rapid increase in patients with osteoporosis and osteoporotic fractures. An osteoporotic fracture is a fracture that occurs after a low energy trauma, such as a fall from standing height. The most frequent types of osteoporotic fractures are fractures of the distal forearm (wrist), proximal femur (hip) and vertebral compression fractures. The other types of osteoporotic fractures seen with increasing incidence are those of the proximal and distal humerus and distal femur.¹

Primary prevention of osteoporosis remains the best form of treatment for osteoporosis. However, in many cases, patients are only aware that they have osteoporosis only after they have suffered an osteoporotic fracture. A patient who has had an osteoporotic fracture is also at increased risk of developing another fracture. The risk of a second osteoporotic fracture occurring after the first one ranges from two to ten-fold.^{2,3} Hence, it is essential to treat osteoporosis once the patient is diagnosed with a fragility fracture to prevent another fracture.

Diagnosis of osteoporotic fractures

Osteoporotic fractures may be missed at initial assessment, as the nature of the injury is often mild and of low energy and not commonly resulting in fractures in a healthy patient. However, in osteoporotic patients, due to bone fragility, these minor injuries can result in fractures, and a high index of suspicion is

required in order not to miss a fracture. Standard radiographs of the injured region should be obtained, and in ambiguous cases, radiographs may be repeated in a different patient position. In cases where the X-rays are normal, but the clinical picture suggests a bony injury, such as inability to weight-bear, severe pain or inability to move a joint, it is recommended that the limb be immobilised and X-rays repeated after 7-10 days, or to perform other imaging such as CT or MRI to evaluate for occult fractures. Hip fracture, especially undisplaced neck of femur fracture, is an example of an osteoporotic fracture that can be missed on X-rays. It is estimated that two to ten percent of occult hip fractures may be missed on initial X-rays.^{4,5}

Proximal femoral fractures

Worldwide, around 4.5 million people are disabled from hip fractures each year, with the number set to increase to 21 million persons living with this disability in the next 40 years. With the emerging elderly population in Asia, it is estimated that by 2050, more than 50 percent of all osteoporotic will occur in Asia.⁶ In Singapore, the incidence of hip fractures has already increased 1.5-fold in males and five-fold in females between 1991-1998, and the number of osteoporotic hip fractures is estimated to reach 9000 cases per year by 2050.⁷

Hip fractures can be classified by their anatomical location with respect to the hip capsule, as intra-capsular fractures such as the neck of femur fracture, and extra-capsular fractures such as inter-trochanteric or subtrochanteric fractures. Most osteoporotic hip fractures are either neck of femur or inter-trochanteric fractures.

Proximal femoral fractures are very challenging to treat. The average age of the patients is close to 80, and due to multiple co-morbidities, these patients have an extraordinarily high mortality rate, with one-year mortality rates reported between 20-25 percent, and as high as 36 percent in various studies.^{8,9}

In addition, these patients are at significant risk for disability. Even among patients who were community ambulant prior to their hip fracture, 11 percent become bedridden, 16 percent end up in a long-term care facility, and 80 percent requires the use of a walking aid one year after the hip fracture.^{10,11}

There is very little role for non-surgical treatment of hip fractures, as patients succumb quickly to pneumonia, bedsores and other problems of prolonged immobility once they become bed-bound. The mainstay of treatment for patients with hip fracture is timely surgery and early mobilisation. These patients are best managed in an orthogeriatric service, where they are treated concurrently by an orthopaedic surgeon and a geriatrician in an orthogeriatric ward. A detailed geriatric assessment of the clinical condition of the patient, their physical and mental capacity, allows for proper preparation for surgery

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and optimal post-operative management. Such procedures have been shown to reduce the rate of complications and improve outcomes.

The type of surgery performed for treatment of elderly osteoporotic hip fractures depends on the anatomical location of the fracture, and whether the fracture has displaced. Non-displaced fractures of the femur neck and inter-trochanteric fractures are usually treated with internal fixation using screws or intra-medullary nails. Displaced femur neck fractures are usually treated with a hip arthroplasty. Figure 1 illustrates the type of hip fracture and recommended surgical treatment.

Most guidelines recommend that surgery for hip fractures be performed within 48 hours after the event. This recommendation is based on multiple studies, which suggest that a shorter time to surgery leads to improved outcomes in patients.^{12,13}

Distal Radius Fractures

Fracture of the distal radius is most commonly an injury of the fit osteoporotic patient.¹⁴ Patients typically stretch out their arm instinctively to break a fall, frequently causing a fracture of the distal radius as a result. These fractures typically result in a dorsally displaced and angulated distal fragment, causing a classic “dinner fork” deformity of the wrist, otherwise also known as a Colles fracture.

Distal radius fractures in osteoporotic patients present a challenge to the orthopaedic surgeon because these fractures are more likely to be unstable and lose alignment after manipulation and casting, as well as being more challenging to treat operatively as the poor quality bone makes it difficult for surgical fixation devices to control the fracture.

A few factors have been found to be associated with greater instability of distal radius fractures, where there is an increased likelihood of fracture displacement despite manipulation and casting. The factors are :

- 1) age over 60
- 2) substantial initial deformity (dorsal tilt greater than 20 degrees on lateral radiograph, or greater than 5mm shortening)
- 3) dorsal comminution
- 4) fracture of the ulna
- 5) displaced articular fracture

Surgical fixation may be favoured in patients whose fracture demonstrates the factors associated with greater instability. Current implants incorporating angular stable locking plates and screws have improved the ability to gain a reliable hold of osteoporotic bone and have improved outcomes for patients.

Nevertheless, decision making for operative or non-operative treatment of distal radius fractures should be based upon a balance of risks and benefits for each patient, and the patient should be involved in a shared decision-making process.

Vertebral Compression Fracture (VCF)

Vertebral compression fractures (VCFs) occur insidiously in the osteoporotic spine and can lead to progressive deformity, functional morbidity and pain. VCFs can be acute or chronic. Acute VCF presents with sudden onset back pain after minimal activity or fall. It can result in severe debilitating pain and limit the mobility of the patient. Chronic VCF occurs more insidiously and is often detected incidentally after patients develop gradual kyphosis or loss of height. Patients with chronic VCF can also present with postural fatigue or chronic back ache, as the normal mechanics of the spine become further compromised by the fractures.

Up to 60 percent of VCFs are asymptomatic initially, as patients do not experience pain after the fracture. Hence, patients may be diagnosed only after they have sustained another more severe fragility fracture, such as a hip fracture.

VCFs can be easily seen on lateral radiographs of the spine. A decrease of 4mm or more than 20 percent of the normal vertebral height (using the vertebrae above or below) is diagnostic of a VCF.¹⁶ Patients with neurological deficits should have an MRI of the spine to exclude a retropulsion of the compression fracture causing the neurological deficits. MRI is also useful to evaluate the acute or chronic nature of the VCF, as well as to exclude malignancy or metastatic disease.

Most patients with VCF can be treated non-operatively with analgesia and bracing. Treatment of the underlying osteoporosis is also essential to prevent other osteoporotic fractures. Surgical treatment of VCFs involves either vertebroplasty - where polymethylmethacrylate (PMMA) bone cement is injected into the vertebral body, or kyphoplasty, which involves using a balloon to expand the vertebral body prior to the injection of the PMMA cement. While many studies show a reduction in pain with surgical treatment, large scale randomised studies have not demonstrated the superiority of surgical treatment over conservative treatment. For now, most surgeons will agree that the indication for surgical treatment of VCF would be chronic pain of two to three months despite analgesic therapy.¹⁷⁻¹⁹

Summary

The incidence of osteoporotic fractures is increasing rapidly. These fractures are more difficult to treat and result in significant morbidity and mortality. Having an osteoporotic fracture also significantly increases the risk of a subsequent fracture. Treatment of osteoporotic fractures will need to be holistic and consider treatment of the fracture, treating the underlying osteoporosis, and addressing the diet and exercise habits of the patient.

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LEARNING POINTS

- **Prior osteoporotic fracture increases the risk of a subsequent fracture.**
- **Hip fractures need timely surgical treatment for a better outcome.**
- **Vertebral compression fractures are mostly asymptomatic.**
- **Early diagnosis and treatment of osteoporosis are important in preventing osteoporotic fractures.**

Figure 1. Recommended Management of Hip Fracture, depending on location and fracture displacement