

# Fragility fractures in the upper limb: proximal and distal humerus

## ABSTRACT

The incidence of fragility fractures of the humerus is increasing worldwide. Although clinicians are aware of fractures of hips and wrists, fractures of the shoulder and elbow do not receive much attention. A considerable proportion of the elderly population (estimated at 10–24%) is dependent on walking aids. A well-functioning and pain-free shoulder and elbow is essential for use of these aids. The impact of loss of mobility in the elderly is well known, hence the overall impact of these fractures on the individual can be considerable. This article increases the awareness of these fractures among non-orthopaedic colleagues and provides a brief outline of their management. In the elderly population using walking aids, the shoulder and elbow are effectively weight-bearing joints. Fractures of the shoulder or elbow in the elderly require extra attention to maintain their mobility during this period by physiotherapy to the lower limbs and chest. In patients who mobilize using a frame, the use of a stick on the opposite side of the injury may have to be considered while recovery is in progress.

**T**he incidence of fragility fractures of the humerus is increasing worldwide. Although clinicians are aware of fractures of hips and wrists, fractures of the shoulder and elbow do not receive much attention. A considerable proportion of the elderly population is dependent on walking aids. Estimates of use in the USA range from 17%–24% of blacks, 14–19.4% of Hispanics, and 10–15.3% of the white population (Kaye et al, 2000; Cornman and Freedman, 2008). A well-functioning and pain-free shoulder and elbow is essential for use of these aids. The impact of loss of mobility in the elderly population is well known, hence the overall impact of these fractures on the individual can be considerable. This article increases awareness of these fractures among non-orthopaedic colleagues and provides a brief outline of their management.

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## Incidence and epidemiology

### Proximal humerus fractures

In the UK in 2001, the highest age-specific incidence of proximal humerus fractures occurred in those aged 80–89 years with a mean age of 72 years (Court-Brown et al, 2001). Kannus et al (2009) found that between 1970 and 1995 the incidence of proximal humerus fractures increased from 8.8 to 30.4 per million women of 80 years or more of age. The prevalence of these fractures is increasing, mainly because of the increasing elderly population, the increased risk of falling and the increasing incidence of osteoporosis (Kannus et al, 2009).

### Distal humerus fractures

Distal humerus fractures have a bimodal age distribution. The first peak occurs during childhood and the second peak is seen in the elderly. In 2000, the estimated incidence in the UK was 0.5 per year per million population while in 2003 the incidence was 0.6 per year per million population (Robinson et al, 2003; Court-Brown and Caesar, 2006). Similar trends have been reported in epidemiological studies done in different countries including France, Canada, Finland and the United States of America (Palvanen et al, 2010; Sheps et al, 2011; Kim et al, 2012; Roux et al, 2012). The increasing lifespan of the population and the increasingly active lifestyle of elderly people have contributed to this rise. Lack of appropriate monitoring of osteoporosis and deficient treatment of osteoporosis are adding to this incidence. This deficiency in care and treatment could be because these fractures are not as life-threatening as neck of femur fractures.

### Mechanism of injury

Osteoporotic upper extremity fractures have a specific mechanism of injury. Most occur after a fall and a direct impact over the fracture site. The commonest cause of proximal humerus and elbow fractures is a fall in the oblique forward direction as reported by the patient. Other common fall patterns include falling on the side, backward or forward, which all cause similar numbers of upper extremity fractures (Palvanen et al, 2000).

### Risk factors

Falls are one of the major risk factors for fractures in elderly patients. Approximately 10–15% of falls result in fractures in elderly people. Lee et al (2002) highlighted risk factors for proximal humerus fractures from the Epidemiologie de l'Osteoporose (EPIDOS) prospective study. These authors evaluated two major risk factors (bone fragility and falls) and

the interaction between them. The authors concluded that the risk of sustaining a fracture is doubled if both factors are present compared to the presence of only one factor. Hence they recommended highest priority of treatment should be given to women with both factors present.

Old age is associated with decreased activity, which leads to decreased use of muscles and makes bones more prone to disuse osteoporosis. The upper limb is particularly sensitive to disuse osteoporosis as the only load acting on the bones is through the muscle tendons. The proximal humerus is especially vulnerable as rotator cuff tears are highly prevalent in the older age group and these are mostly asymptomatic. Osteoporosis is more severe in the proximal humerus of people with shoulder dysfunction than patients without shoulder dysfunction (Kannus et al, 1995).

### Diagnosis

Osteoporosis is normally diagnosed with dual energy X-ray absorptiometry (DEXA) scans of the hip or lumbar spine. However, these do not reflect the severity of the osteoporosis of the proximal humerus. Giannotti et al (2012) suggested that bone densitometry underestimates the humeral bone density. They recommended use of the 'cortical index' for estimating the bone density of the proximal humerus. This is the ratio between the cortical thickness and total diameter of the humeral diaphysis. The limit recommended for fracture risk was 0.231 (Giannotti et al, 2012). Mather et al (2013) found that cortical bone thickness correlates strongly with femoral DEXA and moderately with lumbar DEXA. They identified a proximal cortical thickness of 6 mm as a potential threshold value for predicting osteoporosis. Hence measurement of cortical thickness on X-rays is a rapid, sensitive, relevant and inexpensive method for detection of osteoporosis (Mather et al, 2013).

### Treatment and prevention

#### Proximal humerus fractures

Proximal humerus fractures can be undisplaced or displaced. Most of these fractures can be treated conservatively in a sling for approximately 4–6 weeks followed by physiotherapy. In the elderly population using walking aids, the shoulder and elbow are effectively weight-bearing joints. Therefore, extra attention is required to enhance these patients' mobility during this period by physiotherapy to the lower limbs and chest. Patients who mobilize using a frame may have to use a stick on the opposite side of the injury while they are recovering.

Significantly displaced fractures, fracture dislocations and fractures in patients with previous rotator cuff insufficiency may require surgery. The advantage of operative fixation is early mobilization of the joint with the added benefit of prevention of further fracture displacement (Vachtsevanos et al, 2014). In a patient with multiple medical comorbidities, there is a slightly increased acute risk of intraoperative and postoperative complications. But in patients for whom operative intervention is indicated, the benefits of

## “ Displaced intra-articular fractures are mostly treated by open reduction and internal fixation for better long-term function and stability of the elbow. ”

the procedure outweigh the risks. In a small number of patients with previous rotator cuff insufficiency, a reverse total shoulder replacement might be the operation of choice to predictably improve pain and shoulder function. This procedure involves substitution of the deltoid muscle to perform the basic functions of the rotator cuff. This is achieved by modification of the biomechanics of the shoulder so that the humeral head is converted into a socket and the glenoid into the ball thus reversing the normal ball and socket configuration of the shoulder. The outcomes of this procedure are good (Gigis et al, 2017). Open reduction and internal fixation is another option when there is no evidence of pre-existing rotator cuff disease. This would enhance early mobilization of the arm.

#### Distal humerus fractures

Fractures of the distal humerus have a significant impact on elbow function and can be more difficult to treat. These fractures can be extra-articular or intra-articular. Stable fractures can be treated conservatively but this requires application of plaster and these can take 3–4 months to heal with the elbow immobilized during this period. In the elderly population, this can significantly affect activities of daily living such as feeding and self-care. Displaced intra-articular fractures are mostly treated by open reduction and internal fixation for better long-term function and stability of the elbow. Elbow stiffness is the most common long-term complication of distal humerus fractures but it has much less impact on function if stability and pain relief can be achieved with treatment. Some fractures may not be amenable to reconstruction and patients may be treated by an elbow replacement.

If such fractures involve only the humeral component of the joint a new treatment, hemiarthroplasty, is increasingly performed. This gives a stable, pain-free elbow in a patient with low functional demand. If the ulnar side of the elbow is also involved in the fracture, a total elbow replacement may be the operation of choice. Non-reconstructable and multifragmented fractures around the elbow in a patient unfit for surgery can be treated as a 'bag of bones' with early mobilization (Aitken et al, 2015).

#### Prevention

- Increase understanding around frailty and falls prevention, screening for and early diagnosis and management of osteoporosis
- Exercise and diet are integral to maintaining good health in older people. Thorough assessment for these two factors should be performed along with assessment of frailty in the elderly population during all encounters with health and social care professionals

## KEY POINTS

- Osteoporosis of upper limb and related fractures has received less attention than fractures of the lower limb.
- In elderly people who use mobility devices the upper limb is weight bearing and fractures can result in significant comorbidities.
- Fall and osteoporosis are major risk fractures for these fractures.
- Routine assessment for upper limb osteoporosis and treatment should be undertaken.
- Both surgical and non-surgical treatment options are available for these fractures.

■ Training in frailty recognition and risk of falls and preventing and reducing frailty should be available to all health and social care staff who work with older people. Only with adequate planning and coordination between various teams, and by providing an ideal interface, can the frail elderly be assured a smooth, safe flow in their journey of care in acute hospitals, intermediate and community hospital services and homes and care homes.

Physiotherapy is important in the prevention and treatment of these injuries. Apart from mobilization of the adjacent joints wherever possible (e.g. hand, wrist and elbow for shoulder injuries and hand, wrist and shoulder for elbow injuries), particular attention needs to be given to mobilizing the lower limbs as patients with fractures around the shoulder or elbow may not be able to use walking aids.

## Conclusions

Osteoporotic fractures of the humerus are not extensively studied in the literature. Their incidence is increasing, particularly in the elderly population. They can be very debilitating, especially in people dependent on mobility aids. Routine investigations underestimate the problem. Although most of these fractures can be managed conservatively some definitely warrant operative management, especially elbow fractures. Despite being upper limb fractures, these injuries can have a negative impact on the overall mobility of elderly patients. **BJHM**

*Conflict of interest: none.*

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