REVIEW

Proximal femoral fracture: achievements and prospects

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Introduction

Patients with proximal femoral fracture occupy 20% of all orthopaedic beds at any one time [1]. In postmenopausal women, proximal femoral fracture accounts for more bed days annually than breast cancer, acute myocardial infarction, diabetes mellitus or chronic obstructive pulmonary disease. Most people with a proximal femoral fracture are old: 90% are older than 65 and 75% are older than 75. Most are women: one in six women who reach the age of 80 years will suffer a hip fracture [2, 3]. The incidence is rising, partly because of the ageing population, but the age-related fracture rate is also increasing [4], which may be related to smoking and a more sedentary lifestyle.

Although treated on orthopaedic wards, patients with proximal femoral fracture frequently have complex problems. Eighty percent have hypertension, diabetes mellitus, Parkinson’s disease or dementia [5].

Risk factors

The main risk factors for proximal femoral fracture include osteoporosis, the risk of falling and poor protective mechanisms (e.g. low body weight). The presence of one or more osteopaenic vertebral fractures increases the risk by a factor of 7 [6]. The energy of impact required to fracture the proximal femur in cadavers ranges from 5 to 51 Joules, showing that bone density alone does not determine the fracture risk [7]. Soft tissues can attenuate peak impact force. Thus, energy absorption, in addition to bone strength, helps determine hip fracture and may explain the observed reduced risk in overweight individuals [6].

Additional risk factors include a family history of fracture, height, sedative medication, low levels of daily exercise, poor self-reported health and poor visual depth perception [6].

There is a complex inter-relationship between contributory variables. The rate of proximal femoral fracture per 1000 women-years in individuals with a bone mineral density in the lowest one-third for their age ranges from 2.6 (in those with two or fewer risk factors) to 27.3 (in those with five or more risk factors) [6].

Recovery from proximal femoral fracture

Despite advances in surgical treatment and anaesthesia, mortality at 12 months remains at 20–30%, increasing to 50% in those aged 90 or older. Mortality is greater with extra-capsular than intra-capsular fractures [8]. Most patients have residual disability and some can no longer lead an independent life. Only 40% of patients able to walk independently before proximal femoral fracture are able to do so 6 months after the event. The prognosis depends in part on functional status before the fracture. Of those able to dress independently, only half are able to do so 6 months after the fracture [9].

The causes of impaired mobility after proximal femoral fracture are poorly understood. Compared with age-matched controls, women with a proximal femoral fracture have an accelerated reduction in fast twitch muscle fibre size in the quadriceps. These fibres are important in generating explosive leg extensor power [10, 11], which is essential for mobility [12]. Leg extensor power in the fractured limb is the most important determinant of walking speed and stair climbing time 7 days after surgical fixation [13]. Postural sway correlates with mobility and increases after proximal femoral fracture compared with age- and sex-matched controls [14]. Poor pre-injury mobility, fracture type, advanced age and a high American Society of Anesthesiologists score are associated with poor outcome [15].
Prevention

Although hormone replacement therapy reduces the risk of proximal femoral fracture in postmenopausal women, this protection decreases once treatment is stopped [16]. Women previously given hormone replacement therapy have at best a 15% risk reduction by the time they reach the age when they are most at risk of proximal femoral fracture [17]. There is a 43% reduction in proximal femoral fracture in frail elderly ambulant women living in nursing homes or residential care with the use of 800 units of vitamin D daily and 1.2 g of calcium supplementation [18]. Alendronate reduces the risk of proximal femoral fracture in community-dwelling women with previous vertebral fractures [19].

Exercise leads to increased muscle strength, power and mobility in healthy and very elderly chronically disabled people [20, 21]. Balance training can reduce the risk of falling, and individuals offered tai chi have a 37% lower risk of falling than age-matched controls [22]. Although exercise can reduce the risk of falls, no study has demonstrated a reduction in the rate of proximal femoral fracture [23].

In nursing home residents, Lauritzen reported a 53% reduction in the incidence of hip fracture with the use of hip protectors [24]. However, hip protectors have not gained wide acceptance, perhaps because of poor compliance [25].

Management of proximal femoral fracture—post-surgery

Liaison between orthopaedic surgeons and geriatricians in the management of trauma patients was pioneered by Devas and Irvine. This concept has been widely accepted but there has been little formal evaluation and some conflicting results. Kennie et al. showed improvement in measurements of independence and reduced length of stay, reduced institutional care and more patients returning home when patients were transferred to a geriatric rehabilitation ward with an interdisciplinary team compared with those who remained on orthopaedic wards [26]. However, Gilchrist found no difference in the length of stay, mortality or placement at discharge [27]. Hempsall demonstrated a reduction in median length of stay of 8.5 days, but no difference in mortality, change in dependency, pain or mobility at 6 or 12 months post-fracture [28].

The post-fall syndrome consists of alarm, hesitancy, irregular progress during rehabilitation and a tendency to grasp at objects or people when walking. Fear of further falls can have long-term effects on individuals, with 25% of patients reporting limited activity 15 months post-injury [29, 30]. Despite improvements in technical care, the degree to which patients are able to regain pre-morbid function and independence is disappointing. In general, around 75% of patients return to their pre-fracture accommodation, but this depends on the availability of local services.

The early discharge of patients with proximal femoral fracture to ‘hospital-at-home’ has been extensively studied, and early reports on the opinions of general practitioners, nursing staff, patients, relatives and carers were favourable. Physical function returned more rapidly in those discharged to the scheme and more patients in this group regained their previous level of independence within 6 weeks. Early discharge to hospital-at-home halved the length of stay in hospital [31, 32]. However, function does not return more rapidly, nor is it improved overall in the early discharge group. Patients discharged home early had poorer sleep scores, worse pain control and increased social isolation as judged from the Nottingham Health Profile [33]. Although early discharge may be cheaper, it may not produce as good an outcome as hospital-based rehabilitation. The impact of early discharge on family carers has not been adequately studied.

Future research and developments

All stages in the care of these patients must be closely examined. Individually targeted primary prevention strategies, including an assessment of the risks of falling, the risk of osteoporosis and protective mechanisms, might reduce the incidence of fracture.

Alternative models of orthopaedic–geriatric liaison should be explored. Increased anaesthetist involvement could avoid poor pain relief peri-operatively, which is common and compromises recovery and mobility [15, 34]. Femoral nerve blocks give pain relief after proximal femoral fracture and, together with spinal anaesthesia, these could contribute to early mobilization, but no randomized controlled trials have examined long-term outcome [35, 36]. Further peri-operative interventions to be explored include the administration of growth hormone, which improves outcome measures when given pre-operatively to patients awaiting elective total hip replacement [37]. There are no data on growth hormone treatment in femoral fracture.

In many hospitals in the UK, geriatricians run elderly trauma wards and orthopaedic surgeons perform the surgery: these initiatives must be properly evaluated. Audit might help improve the application of established treatments and guidelines could ensure uniform standards of care [38]. There are no data on hip protectors after a first hip fracture or on strategies to increase bone mass after fracture—most patients are offered no secondary prevention medication [39].

We need widely accepted uniform instruments of health status and outcome which can be applied to different treatment regimes in different hospitals to
ascertain which provide the best outcome. The development of acceptable, valid and reliable outcome measures is a priority for future research.

Alternative approaches to the prevention and management of proximal femoral fractures are required. All stages of care need examining in studies using standardized assessments. This will allow the results to be generalizable and optimize treatment of this common condition.

Key points
• One in six women who reach 80 years of age will suffer a proximal femoral fracture.
• Mortality is high and only 40% of surviving patients able to walk independently before the fracture can do so 6 months afterwards.
• Alternative approaches to prevention and post-surgical management are needed if outcome is to be improved.
• All stages of care need examining in studies using standardized assessments.

References


