Clinical review

Hip fracture

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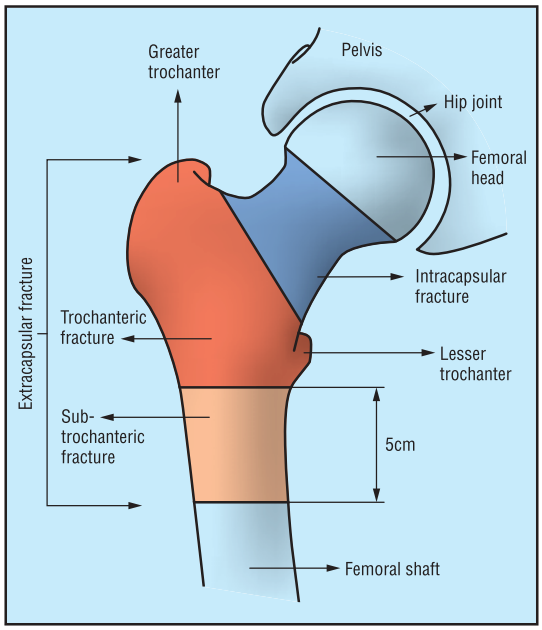
A proximal femoral or hip fracture is the most common reason for admission to an acute orthopaedic ward. About 86 000 such fractures occur each year in the United Kingdom.[w1] Global numbers were reported as 1.3 million in 1990, and depending on secular trends could be 7-21 million by 2050.[1]

In developed countries, the treatment of a hip fracture requires a wide range of disciplines, as the patient will present to the ambulance service and the accident and emergency unit, then pass through departments of radiology, anaesthetics, orthopaedic surgery, medicine, and rehabilitation. Medical and social services in the community may be needed when the patient leaves hospital.

Mortality associated with a hip fracture is about 5-10% after one month. One year after fracture about a third of patients will have died, compared with an expected annual mortality of about 10% in this age group.[2 3 w2] Thus, only a third of deaths are directly attributable to the hip fracture itself, but patients and relatives often think that the fracture has played a crucial part in the final illness.[w2]

More than 10% of survivors will be unable to return to their previous residence. Most of the remainder will have some residual pain or disability.[2 3]



Classification of hip fractures. Fractures in the blue area are intracapsular and those in the red and orange areas are extracapsular

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Search strategy

The musculoskeletal Cochrane review group has identified all randomised controlled trials on hip fractures and most are summarised in Cochrane reviews (www.Cochrane.org) and in Clinical Evidence articles.[4]

For aspects of hip fracture that cannot or have not been subject to randomised controlled trials, we looked at systematic review articles, the evidence based guidelines identified on this topic, and our personal libraries of hip fracture references based on annual Medline searches.[5–7]

Who fractures their hip?

The average age of patients with hip fracture is over 80, and nearly 80% are women.[2] The annual risk of hip fracture is age related and reaches 4% in women over 85.[w3]

Most hip fractures result from a fall or stumble—only about 5% of cases have no history of injury.[w4-w8] Injuries have a multifactorial origin, and they reflect increased tendency to fall, loss of protective reflexes, and reduced bone strength. Rates of hip fracture are three times higher among people living in care homes than in those of the same age living in the community.[w9]

How is the fracture diagnosed and classified?

Most hip fractures are readily diagnosed by a history of a fall that led to a painful hip, inability to walk, or an externally rotated limb, and plain radiographs of the hip that confirm the diagnosis. In about 15% of cases, the hip fracture is undisplaced, and radiographic changes may be minimal[w10]; in a further 1% of cases the fracture will not be visible on plain radiographs, and other investigations will be needed. Magnetic resonance imaging is currently the investigation of choice in this situation.[w11 w12]

Fractures can be classified radiographically into intracapsular and extracapsular fractures (figure). These may be further subdivided, depending on the level of the fracture and the presence or absence of displacement and comminution.[w13-w15]

P+ *Extra references w1-w49 and figures A-D appear on bmj.com*

Healing of intracapsular fractures is complicated by the tenuous blood supply to the femoral head—the retinacular vessels that pass up the femoral capsule may be damaged, especially if the fracture is displaced. This problem does not occur in extracapsular fractures, but up to one litre of blood may be lost from fractures at this site, so fluid replacement and blood transfusion may be needed.

Treatment

The first step is to decide between a surgical or conservative approach. Conservative treatment is now rarely used because of poor outcome and prolonged hospital stay. Conservative treatment of a displaced intracapsular fracture leads to a painful functionless hip. An undisplaced intracapsular fracture can be managed with analgesia, a few days rest, then gentle mobilisation, but the risk of subsequent displacement of the fracture is high, and internal fixation is preferable.[w16-w19]

Extracapsular fractures can be managed with traction, but this must be maintained for one to two months. The frail older people who typically sustain this injury are poorly equipped to cope with prolonged immobilisation, which may result in loss of mobility and independence.[w19 w20] This may precipitate placement into a long term care home—an outcome that some perceive as worse than death.[w21] Thus, most hip fractures are treated by surgery.

Intracapsular fractures may be treated by fixing the fracture and preserving the femoral head.[w22] Preservation of the femoral head is appropriate for undisplaced fractures and for displaced fractures in "younger" patients (under 70). In frail or older people, displaced intracapsular fractures may be treated by reduction and fixation, but the incidence of non-union and avascular necrosis is 30-50% for this procedure, so the femoral head is replaced in most patients.[w23 w24] The approach may be hemiarthroplasty, where just the femoral head is replaced, or a total hip replacement, where both sides of the joint are replaced. Cementing the prosthesis in place results in less pain and better mobility (figs A and B on bmj.com).[w25]

Various types of plates, screws, and nails are available for fixing extracapsular fractures. At present, the sliding hip screw is the most effective device.[w26] Subtrochanteric fractures may also be fixed with a sliding hip screw, but these are increasingly being treated with an intramedullary nail (figs C and D on bmj.com). With current implants and surgical techniques, most patients with hip fracture can be allowed to bear weight on the injured limb, and hip movements should not be restricted after surgery.

Perioperative care

Traction to the limb before surgery seems to be of no benefit.[w27] Spinal anaesthesia may be marginally better than general anaesthesia.[w28 w29] Box 1 lists aspects of good practice that have been recommended for the care of patients with hip fracture.[5–7]

Thromboembolic prophylaxis is a contentious issue. People who sustain a hip fracture are at high risk of thromboembolic complications but are also at risk of the adverse effects of prophylactic drugs. The incidence of thromboembolic complications has fallen as a result of the measures listed in box 2, and the adverse effects of prophylaxis may outweigh the benefits. A systematic review of heparins and a large randomised trial of low dose aspirin noted a reduction in thromboembolic complications with prophylaxis, but at the expense of increased bleeding complications.[w37 w42]

Cyclical leg compression or foot pump devices can reduce thromboembolic complications but are time consuming and costly, and the effectiveness of graduated compression stockings is unclear in these patients.[5 w37] None of these approaches to thromboembolic prophylaxis have been shown to reduce overall mortality after hip fracture.

Box 1 Recommended components of care for patients with hip fracture

From admission
- Adequate, appropriate analgesia
- Supplementary nerve blocks for pain relief[w30]
- Intravenous fluid replacement
- Monitoring of fluid balance
- Assessment of associated injuries and medical conditions
- Fast tracking through the casualty department[w31]
- Use of defined clinical pathways[w32]
- Pressure area assessment and care[w33 w34]

On the ward
- Help with eating in the early postoperative period[w35]
- Nutritional support[w36]
- Thromboembolic prophylaxis[w37]

At surgery
- Surgery within 48 hours of admission[w38-w40]
- Perioperative antibiotic prophylaxis[w41]
- Perioperative supplementary oxygen[5]

After surgery
- Mobilisation the day after surgery
- Early rehabilitation and planning for discharge

Rehabilitation

Rehabilitation should start from the time of admission. It is important for the patient and the family to outline a proposed plan of treatment, along with provisional dates for discharge. This helps them make necessary arrangements, such as getting a bed downstairs.

Many patients who sustain a hip fracture fear that it will result in death or disability, and it is important to set reasonable expectations to restore their morale. However, over optimistic reassurance about the success of surgery may lead to disappointment if rehabilitation is slow. Assessment must be comprehensive in order to

Box 2 Recommended measures to reduce the risk of thromboembolic complications
- Avoidance of dehydration
- Early surgery
- Avoidance of prolonged surgery
- Avoidance of over transfusion
- Early mobilisation

Box 3 Approaches to rehabilitation

Traditional care on the orthopaedic ward, with variable degrees of input from geriatricians

Initial treatment on the orthopaedic ward, with subsequent transfer to a hospital based geriatric-orthopaedic rehabilitation unit[w43]

Initial treatment on the orthopaedic ward, with subsequent transfer to a skilled nursing facility in the community for assessment and rehabilitation[w44]

Shared care on a ward that combines orthopaedic surgical care with geriatric medical assessment and rehabilitation until discharge[w45]

Care on an orthopaedic ward and early discharge home with the support of a community rehabilitation team[w46]

Box 4 Recommended plan for assessing and preventing falls

Clinical assessment to determine the cause of any falls

Assessment of mental state

Medication review

Management of osteoporosis

Visual assessment and correction if possible

Assessment of continence

Assessment of gait and balance disorders

Mobility improvement and strength training for inpatients

Provision of appropriate walking aids and footwear

Home assessment and modification of environmental hazards

Access to strength and balance training after discharge

identify impediments to recovery, set realistic goals, and coordinate appropriate rehabilitation.

Five broad categories of rehabilitation have been described (box 3).[8]

The *National Service Framework for Older People in England* recommends that each hospital should have at least one "orthogeriatric" ward.[9] The optimum model of care is unknown—randomised trials have produced conflicting results and no clear consensus.[10]

Can further fractures be prevented?

Multidisciplinary assessment of the reason for the fall will reduce the risk of further fractures, and the components of such assessments are well described.[11 12] Nearly all patients with hip fracture meet the criteria for such an assessment, which should be performed routinely as part of inpatient rehabilitation care (box 4). A medical cause for the fall should be sought; specifically, hypotension, postural hypotension, arrhythmia, vasovagal syncope, and carotid sinus hypersensitivity. Examination should include lying and standing blood pressure and a 12 lead electrocardiogram.

About 3% of hip fractures are related to localised bone weakness at the fracture site, secondary to tumour, bone cysts, or Paget's disease. More than half of the remaining patients have osteoporosis, and nearly all are osteopenic. Over the age of 80, a woman with normal bone mineral density for her age will have a T score of around −2.5 (the diagnostic threshold for osteoporosis). Thus, assessment of bone density is probably not necessary in older age groups, and current UK guidelines only recommend a dual energy x ray absorptiometry scan for women under the age of 75.[13]

In men and younger women, routine preoperative blood counts and basic biochemistry may need to be accompanied by tests for causes of bone fragility. Malnutrition, low body weight, alcoholism, and deficiency of calcium or vitamin D are common and important at all ages. Treatment with steroids, renal failure, liver disease, hyperthyroidism, hyperparathyroidism, and hypogonadism are other potential causes of bone fragility.

Pharmacological prevention of hip fracture is controversial. An early study showed a benefit of calcium and vitamin D supplementation in residents of care homes. A similar regimen was therefore adopted among people recovering from hip fracture, but this approach has not been supported by later studies.[14 15 w47, w48]

Oral bisphosphonates are widely recommended for secondary prevention of fragility fractures; UK guidelines advocate them for all women over 75 and for younger women with confirmed osteoporosis.[16] The effectiveness of bisphosphonates in the very elderly is not known, although no reason exists to doubt their efficacy in this situation.[17] Careful explanation and counselling are crucial to the effective use of these drugs. Pre-existing gastrointestinal problems raise concern over upper gastrointestinal intolerance, and some frailer patients may have difficulty adhering to the dosing regimen.

Strontium may be an effective and convenient alternative in frailer patients.[w49] Suggestions that strontium may predispose patients to thromboembolism have not been confirmed, but prescription should be delayed until the patient is mobile. Calcium and vitamin D status should be optimised in patients taking bisphosphonates or strontium.

Hormone replacement therapy and selective oestrogen receptor antagonists should be avoided in women recovering from hip fractures, as they greatly increase the risk of thromboembolism.[18 19] Early

Current and future directions for research

New designs and developments in surgical implants

Assessment of many aspects of perioperative care

Definition of the optimum method of rehabilitation

Evaluation of proposed methods for reducing the risk of further fractures

Additional educational resources

Further reading

Parker MJ, Handoll HHG. Hip fracture. *Clinical evidence*. BMJ Publishing, 2005[4]

Scottish Intercollegiate Guidelines Network (SIGN). *Prevention and management of hip fractures in older people*. SIGN Publication No 56. (www.sign.ac.uk/guidelines/fulltext/56/index.html)[5]

Cochrane Database of Systematic Reviews (www.cochrane.org/reviews/clibaccess.htm)

Patient resources

National Osteoporosis Society, PO Box 10, Bath BA3 3YB (www.nos.org.uk)

Summary points

- Hip fracture is the most common cause of acute orthopaedic admission in older people
- Treatment is generally surgical to replace or repair the broken bone
- Mortality is 5-10% after one month and about 30% after one year
- Some loss of function is to be expected in most patients
- Multidisciplinary rehabilitation is needed for the patient to return home
- Ways to reduce the risk of further fracture should be considered

reports of hip protectors, which absorb or spread the energy of a fall, were promising, but recent studies have questioned their effectiveness.[20 21]

Conclusions

Hip fracture is the most common disabling injury and cause of accidental death in older people. The incidence and the public health and economic consequences of this injury have risen as the population has aged, and this is expected to continue for the foreseeable future.

The prevention and management of hip fractures involves a wide range of disciplines, and most people who sustain the injury require surgery followed by a period of rehabilitation. The complexity of care needed for hip fractures makes the condition a real test and a useful marker of the integration and effectiveness of modern health care.

Competing interests: None declared by MP. AJ received reimbursement of conference expenses and fees for non-promotional lecturing from the manufacturers of various oral bisphosphonates.

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Corrections and clarifications

Minerva

Minerva apologises for nearly launching a health scare. As many readers have pointed out, she slipped up somehow in her assertion that long term use of antiepileptic drugs is associated with an increased risk of cancers, particularly in women (*BMJ* 2006;332:1282, 27 May). The source article (*Neurology* 2006;66:1318-24) quite clearly refers to a risk of fractures, not cancer.

Selective serotonin reuptake inhibitors (SSRIs) and suicide in adults: meta-analysis of drug company data from placebo controlled, randomised controlled trials submitted to the MHRA's safety review

The authors of this article published last year, David Gunnell and colleagues, have alerted us to an error in the abridged version of their paper (*BMJ* 2005;330:385-8). In the table, the correct estimate for the pooled odds ratio for self harm from the bayesian random effects meta-analysis for non-fatal self harm in relation to use of selective serotonin reuptake inhibitors (excluding paroxetine) is "1.57 (credible interval 0.99 to 2.55)"—not 1.51 (0.95 to 2.49). This matches the values given in the abstract and in the results section of the paper.

Randomised, controlled trial of alternating pressure mattresses compared with alternating pressure overlays for the prevention of pressure ulcers: PRESSURE (pressure relieving support surfaces) trial

An editorial misunderstanding during the proof stage led us to inflate some values in this paper by Jane Nixon and colleagues (*BMJ* 2006;332:1413-5, 17 Jun). In table 4 of the full version on bmj.com (table 2 of the abridged version), the haemoglobin levels on admission or preoperatively should be 0.89 (0.82 to 0.97) [not 8.9, 8.2 to 9.7], and the corresponding P value should be 0.01 [not 0.1].