Management of hip fracture

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Abstract

Introduction: Hip fracture poses a significant global challenge both to healthcare systems and to patients themselves. We outline the management of this injury, highlight areas where the evidence is deficient and discuss research efforts towards improving the quality of the evidence base.

Sources of data: We searched MEDLINE, PubMed and the Cochrane Library, using the core search terms ‘hip fracture’ and ‘proximal femoral fracture’. In addition we reviewed national treatment guidelines for hip fracture care and references from relevant articles. Only articles published in English from inception to March 2015 were included.

Areas of agreement: Modern hip fracture management should consist of a coordinated multidisciplinary approach with orthogeriatrician input, early surgery, adequate analgesia and liaison with related services to facilitate safe supported discharge.

Areas of controversy: The optimum thromboprophylaxis to reduce venous thromboembolism remains a topic for debate. The use of bone cement has received much attention recently with concerns about its safety in the frailest of hip fracture patients.

Growing points: An increasing understanding of the severity and impact of sustaining a hip fracture upon quality of life.

Areas timely for developing research: Strategies to improve postoperative mobility, postoperative nutrition and the role of home-based rehabilitation. There is a need to identify the optimum analgesic regimes and assessment tools for hip fracture patients with cognitive impairment.

Key words: hip fracture, proximal femoral fracture, orthogeriatrician
Introduction

Osteoporotic fractures of the proximal femur hereafter referred to as hip fractures, present a major global challenge to healthcare systems and to patients. There were 1.31 million hip fractures in 1990, a figure predicted to rise to 6.26 million globally by 2050. The estimated socio-economic costs represent 0.1% of the global burden of disease world-wide and 1.4% in the established market economies. For patients themselves, sustaining a hip fracture is a potentially catastrophic event. Approximately 30% will die during the first year following this injury and those who survive will have an appreciable ongoing burden of illness affecting their quality of life.

In response to the scale and severity of the problem, a number of national bodies have published evidence-based treatment guidelines supported by systematic reviews of the published literature. What emerges from these guidelines is that modern hip fracture care is a coordinated multidisciplinary effort which acknowledges that sustaining a hip fracture is a marker of deteriorating general health status.

In this review we outline the main aspects of modern hip fracture management based on previous evidence summaries and national guidelines, highlight areas where the evidence base is deficient and review strategies for improving the quality of future research for this important group of patients.

Diagnosis and classification of the patient with a hip fracture

Osteoporotic hip fractures typically occur in the elderly population and result from low energy trauma (e.g. a fall from standing). The latest report from the UK National Hip Fracture database (NHFD) reveals that 91.6% of hip fractures occur in patients over 70 years of age and the majority (72%) are female. This distribution reflects the increasing likelihood of falling, one in three people aged over 65 years will fall each year, and of osteoporosis with advancing age. Those sustaining a hip fracture often have significant comorbidities (e.g. diabetes, impaired mobility/balance, cardiovascular disease) and up to 40% will have cognitive impairment. The patient usually presents with hip pain and the inability to weight bear. The affected leg may be shortened and externally rotated. The majority of hip fractures will be diagnosed with plain radiographs although a minority will have clinical signs and symptoms suggestive of a hip fracture but with apparently normal plain radiographs, the so-called ‘occult hip fracture’. In these cases the gold standard imaging technique is magnetic resonance imaging (MRI) although computed tomography (CT) may be more readily available in most hospitals.

Hip fractures can be classified as intra or extracapsular, that is, a fracture inside or outside the joint capsule of the hip. This broad anatomical distinction is important since it reflects the likelihood with which the blood supply to the femoral head is disrupted. The fracture characteristics are then further scrutinized to determine the degree of displacement and comminution. This will guide the decision to treat with arthroplasty versus internal fixation in the case of intra-capsular fractures, or guide the type of biomechanical construct required to stabilize extracapsular fractures to allow healing to occur (i.e. Intramedullary fixation with a Nail or Extramedullary fixation with a Sliding Hip Screw). The majority of patients will have surgery since the benefits of early fixation/replacement to facilitate rapid postoperative mobilization, outweigh the risks of surgery and avoid poor outcomes associated with long-term immobilization due to non-operative management.

A practical classification of hip fractures is shown in Figure 1. This is based on the AO classification of hip fractures where the alpha-numerical subdivisions refer to the fracture morphology—we will refer to these subdivisions in the section on Surgery.

Anaesthesia and analgesia

Adequate analgesia forms an important part of the care of patients presenting with a hip fracture, both in the immediate phase to reduce discomfort, allow diagnostic investigations and reduce additional morbidity/mortality from increased pain and postoperatively in order to facilitate early mobilization. The evidence base for systemic analgesia in hip fracture is limited and national guidelines are predominantly based on consensus amongst guideline development groups.
These groups agree on the routine use of regular paracetamol, unless contraindicated, with additional opioids if required and the avoidance of non-steroidal anti-inflammatories in this predominantly elderly group of patients. There is no evidence that traction, neither skin nor skeletal, has any beneficial role in

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**Fig. 1** Classification of hip fractures. The alpha-numeric subdivisions correspond to the morphology of the fracture as per the AO classification.¹⁶
the management of patients with a hip fracture. The use of regional anaesthesia (nerve blocks) administered by trained personnel, both pre and intraoperatively, is recommended to not only provide effective analgesia but specifically to reduce the requirement for systemic opioids and subsequent opioid-induced delirium. However, analgesia should in no way be used as a substitute for early surgery. Achieving and assessing pain relief in patients with cognitive impairment is challenging. There is a need for high quality studies in this area to identify the optimal assessment tools and analgesic regimes such that pain assessment in the cognitively impaired is more rigorously addressed in our normal practice and care of patients with a hip fracture.

There is no strong evidence in favour of spinal anaesthesia over general anaesthesia, or vice versa, and the decision is therefore dependent on a thorough anaesthetic review and, where possible, discussion with the patient. An observational study of 65,535 from the UK NHFD found no significant difference in the 5-day or 30-day mortality between patients who had spinal and general anaesthesia, even after adjustment for age and physical status.

**Surgery**

Hip fracture surgery is an emergency and there is increasingly strong evidence that early surgery—on the next available trauma operating list—is associated with a lower risk of death and incidence of pressure sores.

Displaced intra-capsular fractures (See Fig. 1, Intra-capsular B3 fractures) account for approximately half of hip fractures. In these fractures, the head of the femur is broken off the neck. The blood supply to the femoral head is tenuous and, even if the fracture is fixed back in to its anatomical position, fracture healing is unreliable. Hip hemiarthroplasty (femoral head replacement) is therefore offered to the majority of these patients and the current evidence base supports the use of bone cement. However, the use of bone cement is not without risk, particularly in the frailest patients, with reports of increased morbidity and mortality in the intra-operative and immediate postoperative period secondary to bone cement implantation syndrome. Fortunately, this is a rare complication and the current evidence base points towards improved pain and functional outcomes in patients with cemented implants compared with un-cemented implants. A cemented total hip replacement should be offered to those patients with the highest levels of pre-fracture mobility (i.e. able to walk independently outside), who are not cognitively impaired and who are medically fit to undergo a longer operation. For un-displaced intra-capsular fractures (Fig. 1, Intra-capsular B1 fractures) and in young patients, it is reasonable to preserve the femoral head by performing internal fixation with devices which allow controlled collapse of the fracture until healing occurs e.g. cannulated hip screws or a 2-hole Dynamic Hip Screw.

Sliding hip screw fixation is well established in the treatment of extra-capsular hip fractures and in the majority of these fractures (Fig. 1, extra-capsular A1 and A2 type) is very effective at allowing controlled collapse of the fracture with consequent mechanical stability leading to fracture union. In more complex unstable fractures patterns (A3 types) there is comminution and deficient bone to share load with the fixation device. Rather than controlled collapse along the line of the screw, the fracture may collapse into varus with cut out of the screw from the head, or the femoral shaft may medialize excessively leading to mechanical failure. In these fractures, and in subtrochanteric fractures (ST type), an intramedullary nail offers a more stable construct and is widely used.

Despite clear guidelines on the type of implants used there remain some gaps in the evidence base for application of modern implants to certain fracture patterns, for example the use of modern un-cemented hemiarthroplasty in B3 fracture types, the use of third generation intramedullary nails for ‘unstable’ extra-capsular A2 fractures, and the impact of cement augmentation techniques in osteoporotic per-trochanteric femoral fractures for which there is now some evidence from both clinical and biochemical cadaveric studies although this is very much an evolving area. Their impact on current guidelines will depend on producing high quality evidence with demonstrable improvements in the outcomes important to patients.
Thromboprophylaxis

The issue of thromboprophylaxis for hip fracture patients has received much attention and remains a topic of debate. There is no doubt that patients with a hip fracture are at risk of deep vein thrombosis (DVT) and it is likely that early surgery and mobilization play an important part in mitigating this risk. However, the value of chemical thromboprophylaxis remains contentious and the associated adverse events (i.e. bleeding, wound haematoma) may well outweigh the intended benefits. Nevertheless, the evidence to date does show that antiplatelet agents and heparin reduce the risk of DVT but increase the risk of bleeding.10,17,32 Given the potential increase in morbidity and mortality from thromboembolic events most national guidelines recommend the use of thromboprophylaxis.5,17,33 There is some evidence supporting the use of graduated compression stockings and cyclical leg compression devices in reducing DVT but they are associated with poor compliance and skin abrasions.10,34

Multidisciplinary care and rehabilitation

Modern models of care for patients with a hip fracture, such as the ‘hip fracture programme’ in the UK or the ‘orthogeriatric model of care’ in Australia, recognize the importance of multidisciplinary care35 in optimizing the care of patients with a hip fracture, and adopt a shared-care approach towards achieving this (see Box 1). In practice this means that the process of rehabilitation begins at the outset with the involvement of specialist orthogeriatricians. The key role of the orthogeriatrician is to optimize the patient’s medical condition in the peri-operative period in order to facilitate accelerated rehabilitation and early supported discharge.36,37 Mobilization on the day after surgery is recommended,38 and there is some evidence that more intensive therapies may be more effective at improving mobility than less intensive strategies.39,40 However there remains uncertainty about which is the best overall strategy to improve the mobility of patients recovering from a hip fracture.41 Few high quality studies have addressed the role of nutrition in the postoperative rehabilitation and outcomes of patients recovering from a hip fracture.42–44 There is moderate evidence6 that dietary supplementation, to prevent protein and energy malnutrition, improves postoperative nutritional status and is associated with decreased mortality.42

Fracture prevention

Fracture prevention is an important part of the holistic care of all elderly patients, particularly in those recovering from a hip fracture. Two main fracture prevention strategies are employed: reducing the risk of falls and improving the patients overall bone health. The components of a falls risk assessment include a clinical assessment to identify medical causes for falling (e.g. postural hypotension, syncope, arrhythmia) and should be coupled with basic investigations, such as a lying and standing blood pressure and a 12-lead ECG, and a review of current medications. Mechanical causes for falling such as poor mobility, balance and impaired vision should be assessed and
linked to a home assessment with modifications if required (e.g. installing rails, bath equipment, stair lift, removal of loose rugs, improving poor lighting). There is evidence in favour of multi-component exercise interventions, home safety interventions in those with poor vision and cardiovascular pacing in people with carotid sinus hypersensitivity, to reduce the overall risk of falling.\textsuperscript{45}

A bone health profile is obtained by performing routine blood tests to identify calcium or vitamin D deficiency and a review of medications (e.g. steroids) and comorbidities (such as liver and renal disease), which may contribute to the risk of sustaining fragility fractures. Secondary prevention of osteoporotic fragility fractures with oral bisphosphonates is initiated in postmenopausal women over 75 years of age and in younger women with confirmed osteoporosis (a T-score of $-2.5$ SD or below on dual energy x-ray absorptiometry).\textsuperscript{46}

\section*{Research}

Despite the global scale of the problem and the huge impact of sustaining a hip fracture on a patients quality of life, our understanding of this challenging injury is still very much evolving and there remains a lack of high quality evidence for many of the treatments we offer. This is perhaps unsurprising given the complexities of the interventions and the heterogeneity of the populations we treat. Nevertheless, the existing evidence base in orthopaedics is often criticized for its poor methodology and lack of applicability to clinical practice, and has been found to compare ‘unfavourably’ with other fields of medicine.\textsuperscript{47,48} However, this situation is changing with a number of developments which promise to improve the quality of the evidence base. There has been a ‘shift’ amongst the orthopaedic research community away from competition and instead towards collaboration with the recognition that large collaborative trials are better placed to answer the important research questions in our field.\textsuperscript{49} This has resulted in international collaborations recruiting to large multi-centered randomized controlled trials (RCTs) such as the INSITE (Intramedullary Nail Versus Sliding Hip Screw Inter-Trochanteric Evaluation, Trial ID: NCT01380444) and HEALTH (Hip Fracture Evaluation with ALteratives of Total Hip Arthroplasty versus Hemiarthroplasty, Trial ID: NCT00556842) trials and the establishment of collaborative groups such as the International Fragility Fracture Network\textsuperscript{50} and the International Hip Fracture Research Collaborative (IHFRC).\textsuperscript{51}

We are beginning to gain a better understanding of what is important to patients in their recovery from a hip fracture and this has informed consensus studies to derive a core outcome set for future RCTs in hip fracture surgery.\textsuperscript{52-54} This, along with a move towards large collaborative trials, should improve the problem of a fragmented evidence base with heterogeneous outcomes which hinder pooling of data and meta-analysis.

The use of ‘big data’ from national registries is a powerful tool to answer research questions for which RCTs might not be feasible. In the UK, the infrastructure associated with this data collection\textsuperscript{55} is now being exploited for research by expanding the routine data collected to include patient-reported outcomes. The resultant cohort\textsuperscript{56} not only provides a tool for monitoring patient outcomes but also presents an opportunity to embed multi-centre RCTs.

\section*{Conclusions}

Hip fractures present a huge challenge to patients and healthcare systems. The management of this injury requires a coordinated multidisciplinary intervention which extends far beyond the operating room. As the burden of disease increases the real challenge lies in prevention, and developing strategies to improve the quality of life in this important group of patients.

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\section*{References}


