

Hip fractures

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Abstract

In the UK the incidence of hip fractures is nearly 76 000 cases per year, with the vast majority of these fractures occurring in patients over the age of 70 years. Most patients who sustain a hip fracture will have significant comorbidities and up to 40% will have cognitive impairment. For patients, sustaining a hip fracture can potentially be a devastating event. This article provides an overview of the presentation, assessment and management of hip fractures for core surgical, acute care common stem and emergency medicine trainees.

Key words: Hip fractures; Neck of femur; Multidisciplinary team; Trauma

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Introduction

The term hip fracture is often used to describe any fracture of the proximal femur extending from the femoral neck to the proximal femoral shaft. This term can be misleading, however, as it does not include fractures of the acetabulum, which also form part of the hip joint. In the UK the incidence of hip fractures is nearly 76 000 cases per year (Royal College of Physicians, 2020), with the vast majority of these fractures occurring in patients above the age of 70 years (Royal College of Physicians, 2020). The prevalence of this injury is 2–3 times higher in women than in men (Zuckerman, 1996). The predominant mechanism of injury is low energy trauma, that is a fall from a standing height. A proximal femoral fracture in younger patients is rare and most likely to result from axial loading during high energy trauma (such as a road traffic collision).

Most patients who sustain a hip fracture will have significant comorbidities, and up to 40% will have cognitive impairment (Seitz et al, 2011). For patients, sustaining a hip fracture can potentially be a devastating event (Fernandez et al, 2015). In the UK, about 7% of patients with a hip fracture will die within 1 month of the injury, with a 30% mortality rate at 1 year (Royal College of Physicians, 2020). With the introduction of multidisciplinary care, the National Hip Fracture Database and best practice tariff (NHS England and NHS Improvement, 2019; Royal College of Physicians, 2020), the mortality rate has started to improve.

This article provides an overview of the presentation, assessment and management of hip fractures for core surgical, acute care common stem and emergency medicine trainees.

Anatomy

The hip is a ball and socket joint whose primary function is to bear weight. It consists of an articulation between the pelvic acetabulum and the head of the femur. Both the acetabulum and head of the femur are covered in articular cartilage. The hip joint is surrounded by a strong and dense articular capsule. Proximally the capsule attaches to the edge of the acetabular margin 5–6 mm beyond its labrum; distally it attaches to the intertrochanteric line anteriorly and to the base of the femoral neck posteriorly. Understanding the hip joint capsule and its margins is important for classification of hip fractures (see below).

The proximal femur has two important landmarks – the greater and lesser trochanters – which are important sites for muscle attachments. The hip abductors and short external rotator muscles insert onto the greater trochanter, and the iliopsoas muscle onto the lesser trochanter. These muscular attachments are important as they act as deforming forces, resulting in characteristic fracture patterns. The proximal fragment is often abducted, flexed and externally rotated by the glutei, iliopsoas and short external rotators respectively. The adductor muscles shorten and adduct the distal fragment.

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The blood supply to the femoral head passes retrograde from distal to proximal along the femoral neck to the femoral head. The major blood supply to the femoral head is via the medial femoral circumflex artery. This anastomoses with the lateral femoral circumflex artery (both branches of the profunda femoris artery) at the base of the femoral neck to form a ring from which branches arise to supply the femoral head. Damage to the medial circumflex artery, which occurs most commonly in displaced intracapsular fractures, disrupts this blood supply and can result in avascular necrosis of the femoral head.

Understanding the blood supply is fundamental to the decision-making process in treating hip fractures; intracapsular fractures, where the risk of avascular necrosis is high, leads to the femoral head being discarded during surgery, whereas maintenance and fixation of the femoral neck is performed for extracapsular fractures where there is no compromise to head vascularity.

Classifications

Hip fractures can broadly be classified into two main groups which are described relative to the joint capsule. A fracture above the insertion of the capsule of the hip joint is intracapsular, and a fracture below the insertion is extracapsular. Extracapsular fractures can be subdivided into intertrochanteric (along a line drawn between the greater and lesser trochanters) and subtrochanteric (in the area of the lesser trochanter to 5 cm distal).

The majority of patients with hip fractures will undergo surgery as the benefits outweigh the potential risks associated with non-operative treatment and prolonged immobilisation (Parker and Johansen, 2006). For this reason, a practical classification of hip fractures based on the AO classification is useful to describe the fracture and help guide surgical management ([Table 1](#)) (Fernandez et al, 2015).

Clinical presentation

Patients typically present with a history of fall followed by pain in the hip or groin and inability to bear weight. The affected leg may be shortened, abducted and externally rotated. In impacted or undisplaced fractures there may be no obvious clinical deformity, but pain may be elicited with active or passive hip range of motion. Hip fracture can also present as an insufficiency fracture in patients with severe osteoporosis and no history of trauma. An insufficiency fracture is a type of fracture that would not otherwise occur were it not for pathological weakening of the bone as a result of osteoporosis, metastasis, infection, metabolic disorders or other systemic or local disease. Patients with an insufficiency fracture often present with vague pain in the hip, groin or buttock without injury.

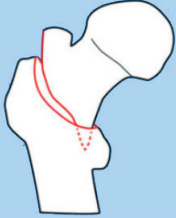
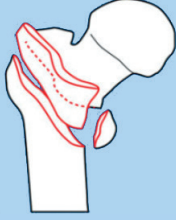
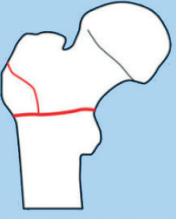
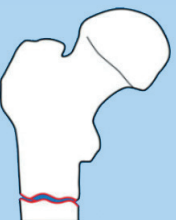
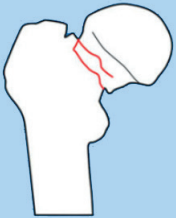
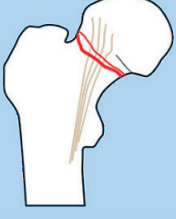
Imaging

Initially plain radiographs including antero-posterior view of the pelvis and lateral view of the hip should be obtained. If the fracture is subtrochanteric then full length femur radiographs may also be useful to determine the distal extent of the fracture. Where there is a high index of suspicion of fracture and radiographs are inconclusive, the gold standard investigation is magnetic resonance imaging. If magnetic resonance imaging is not available within 24 hours of presentation or is contraindicated, then computed tomography should be considered (National Institute for Health and Care Excellence, 2017a).

Treatment in the emergency department

History taking should include a thorough detailing of the circumstances of the fall, including any preceding symptoms and loss of consciousness, which might point to a cardiogenic or neurological cause. The patient's comorbidities and social history (such as living circumstances and pre-injury mobility) are important for preoperative planning and postoperative rehabilitation. Specifically asking if patients are currently on anticoagulant medication, such as warfarin or a direct oral anticoagulant, is important as this can affect the timing of surgery. Protocols for the reversal of anticoagulation must be available

Table 1. A practical classification of hip fractures with appropriate treatment

Fracture pattern	Treatment options
Extracapsular  Stable intertrochanteric	<ul style="list-style-type: none"> • Dynamic hip screw fixation
 Unstable multifragmentary	<ul style="list-style-type: none"> • Intramedullary nail fixation • Dynamic hip screw fixation
 Reverse oblique	<ul style="list-style-type: none"> • Intramedullary nail fixation
 Subtrochanteric	<ul style="list-style-type: none"> • Intramedullary nail fixation
Intracapsular  Displaced	<ul style="list-style-type: none"> • Hemiarthroplasty (patients who are poorly mobile and/or cognitively impaired) • Total hip replacement (patients who are able to walk independently outdoors with no more than the use of one stick, are not cognitively impaired and are medically fit)
 Undisplaced	<ul style="list-style-type: none"> • Internal fixation (cancellous screw or dynamic hip screw) • Hemiarthroplasty • Total hip arthroplasty • Non-operative treatment (only in exceptional cases)

within hospitals. All patients should have their risk of venous thromboembolism assessed preoperatively and be treated accordingly (British Orthopaedic Association, 2019). Many elderly patients may have relative cognitive impairment and an Abbreviated Mental Test Score should be carried out in the emergency department to assess baseline cognition. Discussion with the patient's next of kin is essential for further information as well as communication around resuscitation status and treatment escalation plans. These conversations must be documented and must include the patient and those close to them, considering advanced directives, lasting powers of attorney and safeguarding issues. Some patients may have a community do not attempt cardiopulmonary resuscitation form and it is vital that this is identified on initial presentation to the hospital.

A full neurovascular assessment of the affected limb should be carried out, specifically commenting on the function of the sciatic nerve. It is also important to perform a full cardiovascular and respiratory examination, assessing for any clinical signs that may have contributed to the patient's fall, such as a chest infection or heart murmur. Baseline blood tests including full blood count, urea and electrolytes, creatinine and coagulation screen are required, as well as group and save. If there was a delay in presentation to hospital then a creatine kinase level is required to assess for rhabdomyolysis. Electrocardiogram, chest radiograph and urinalysis are useful for both falls assessment and preoperative work up in these patients.

The patient's pain should be assessed immediately upon presentation to hospital and again within 30 minutes of administering initial analgesia according to National Institute for Health and Care Excellence (2017a) guidelines. Paracetamol should be offered every 6 hours preoperatively, unless contraindicated, alongside additional opioids as required. Non-steroidal anti-inflammatory drugs are not recommended (National Institute for Health and Care Excellence, 2017a). The use of nerve blocks should be considered in all patients, not only to provide adequate analgesia, but also to reduce the requirement for systemic opioids. In most emergency departments, fascia iliaca blocks are performed by trained personnel under ultrasound guidance or using the landmark technique. There is no evidence that either skin or skeletal traction has any benefit in reducing pain in patients with a hip fracture (Roberts et al, 2015).

Discussions about fracture management should be held early and involve the patient and their family. The patient should be aware of the risks and benefits of surgical fixation and any alternative management options, including conservative management, which is important to discuss during the consent process. It is essential that the patient and family understand that without surgical management the patient must undergo a period of prolonged bedrest, which is thought to be associated with significantly increased morbidity and mortality (van de Ree et al, 2017). The Nottingham Hip Fracture Score can be used to help identify high-risk patients and to predict the probability of mortality at 30 days (Maxwell et al, 2008).

General approach to hip fragility fractures

There is clear guidance from both the National Institute for Health and Care Excellence (2017a) and British Orthopaedic Association (2019) ([Table 2](#)) on all aspects of the management of hip fractures. There is particular emphasis on early mobilisation and shared care within a multidisciplinary team. Members of the multidisciplinary team include orthogeriatricians, anaesthetists, physiotherapists, occupational therapists, dieticians, orthopaedic specialist nurses and orthopaedic surgeons. There is the need for holistic, not just surgical, care of these frail patients with complex health and care needs, for example the need for nutritional assessment and ongoing bone health for secondary prevention of further fractures. Patients should be rapidly optimised to allow surgery to proceed on the day of or the day after admission, because of the risks of prolonged bed rest (such as hospital-acquired infection or pressure ulcers). National Institute for Health and Care Excellence (2017a) and British Orthopaedic Association (2019) guidelines recommend that patients with a hip fracture undergo orthogeriatric assessment on admission and are cared for jointly by an orthopaedic and medical team during their hospital admission.

Table 2. Key points from the BOAST guidelines on the care of the older or frail orthopaedic trauma patient relevant to hip fractures

All patients should be managed using a frailty pathway which includes comprehensive geriatric assessment commencing within 72 hours of injury
Ceilings of treatment, including transfer, escalation and the appropriateness of cardiopulmonary resuscitation, should be discussed jointly by the treating teams. This should include the patient and those close to them, considering advanced directives, lasting powers of attorney and safeguarding issues, and the outcomes documented. These decisions should be made at consultant level and before any surgery
Pain management must be through a defined strategy using patient-specific tools and incorporating peripheral nerve blockade when appropriate
All patients should have a multifactorial falls risk assessment and should be referred to falls prevention services if indicated
All patients should have a bone health review, be investigated and prescribed appropriate medication when indicated
All patients should have a nutritional assessment. No patients should be made nil by mouth unless immediate surgery is planned
Units should routinely use a validated delirium assessment tool (such as the 4AT) and have a delirium policy which describes preventative measures, ensures rapid identification of potentially reversible causes and delivers individualised interventions in line with National Institute for Health and Care Excellence (2010) guidance
All surgery in the frail patient should be performed to allow full weight-bearing for activities required for daily living and within 36 hours of admission, in line with current hip fracture care. Patients should be seen by a physiotherapist on postoperative day one with early identification of functional rehabilitation goals
All patients must be entered into a discharge-planning pathway with a rehabilitation prescription and clear coordination between inpatient and outpatient therapists
Each hospital should submit data to national databases (National Hip Fracture Database, Fracture Liaison Service-Database and the Trauma Audit & Research Network) to monitor its performance against national benchmarks and quality standards

From British Orthopaedic Association (2019)

Table 3. Summary of the best practice tariff for hip fractures for 2019–20

1	Time to surgery from arrival in an emergency department, or – if an admitted patient – time of diagnosis to the start of anaesthesia, is within 36 hours
2	Assessment by a geriatrician in the perioperative period (within 72 hours of admission)
3	Fracture prevention assessments (falls and bone health)
4	An abbreviated mental test performed before surgery and the score recorded in the National Hip Fracture Database
5	A nutritional assessment during the admission
6	A delirium assessment using the 4AT screening tool during the admission
7	Assessed by a physiotherapist the day of or day following surgery

From NHS England and NHS Improvement (2019)

Best practice tariff for hip fractures

A best practice tariff was introduced in 2010 to reduce variations across the country in quality of care and non-compliance with best practice evidence (NHS England and NHS Improvement, 2019). This gives trusts a formal financial incentive to comply with best practice in line with National Institute for Health and Care Excellence guidance (2012; 2017a). The payment is not considered a ‘reward’ for compliance, rather it reflects the cost of care (Gershlick, 2016). If a trust achieves all seven points (Table 3), it is paid £1335 per patient (NHS Improvement, 2019). An assessment of national clinical audit data concluded that interventions driven by pay-for performance in England led to 7600 fewer deaths within 30 days of hip fractures between 2010 and 2016 (Metcalf et al, 2019). In April 2020, the scope of the best practice tariff was extended to include femoral shaft and distal femoral fractures (National Hip Fracture Database, 2019).

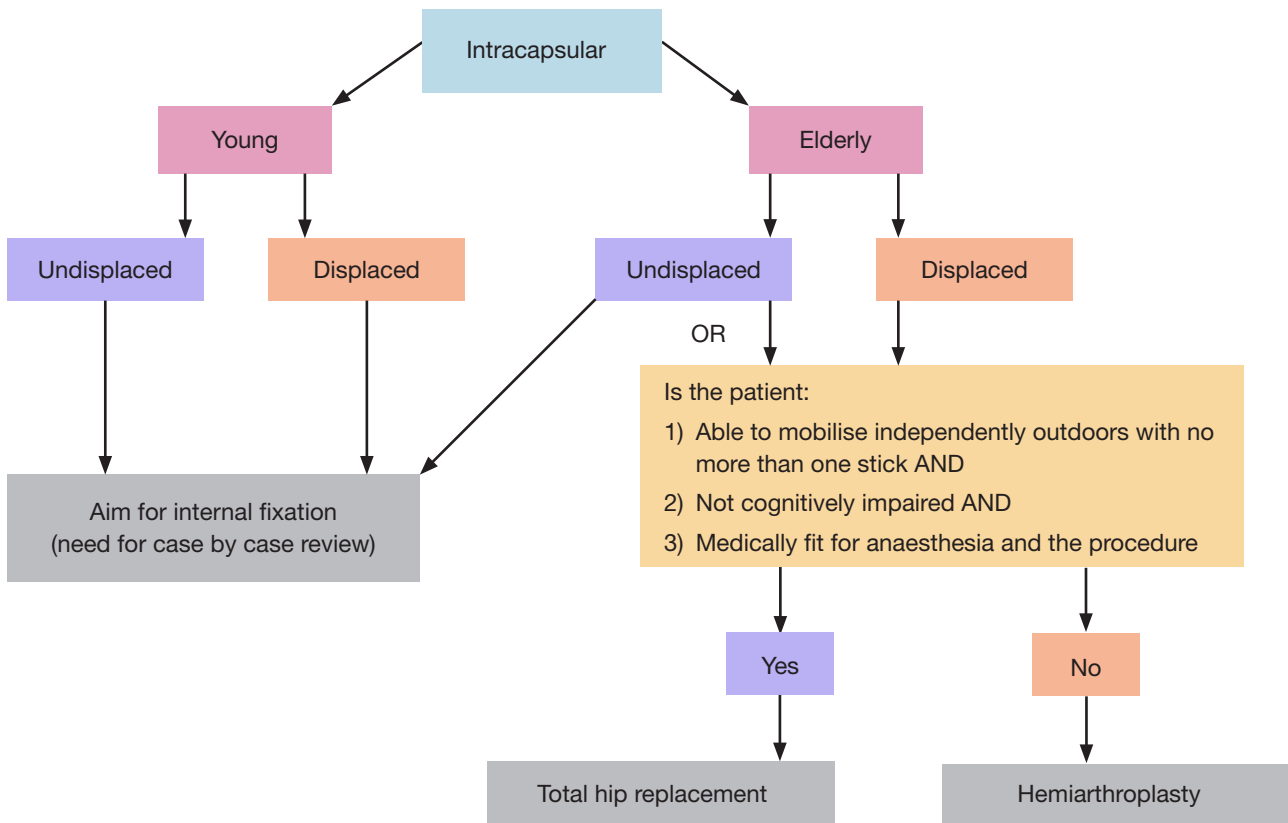


Figure 1. A flow diagram summarising the surgical management options for intracapsular neck of femur fractures.

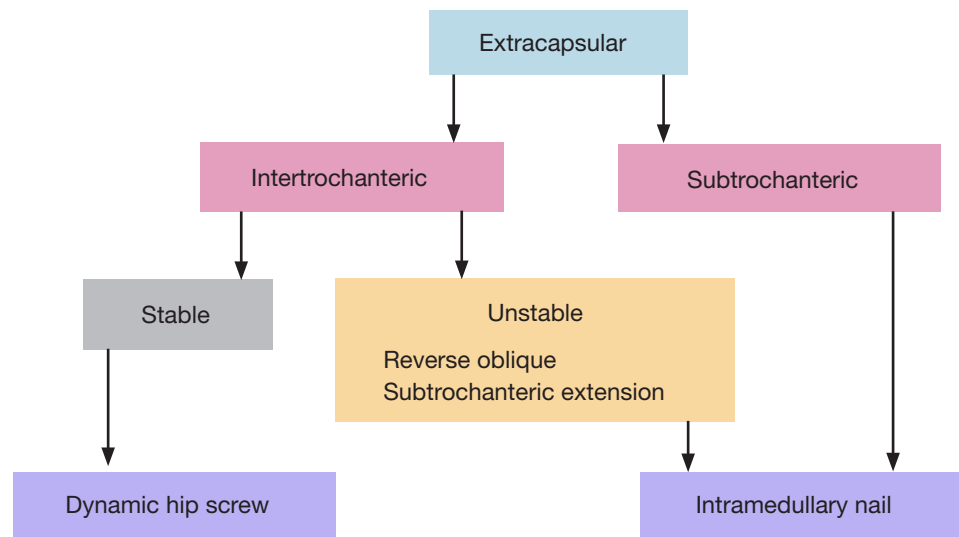


Figure 2. A flow diagram summarising the surgical management options for extracapsular neck of femur fractures.

Surgical management of hip fractures

Surgical decision making regarding the treatment of hip fractures depends on fracture configuration (Table 1). The patient's age, medical history and pre-injury mobility status will determine the appropriate surgical option. Figures 1 and 2 can be useful tools to help guide surgical management options for intracapsular and extracapsular neck of femur fractures.

For all fractures, the aim of surgical treatment is to allow patients to fully bear weight immediately after surgery (National Institute for Health and Care Excellence, 2017a). There is no strong evidence in favour of spinal anaesthesia over general anaesthesia and the

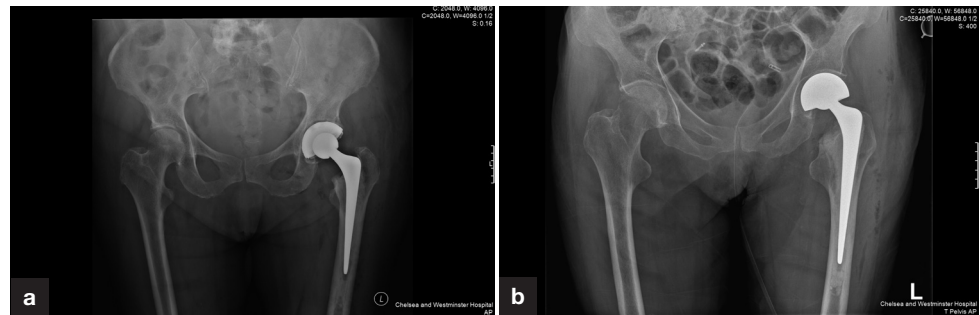


Figure 3. a. An antero-posterior radiograph of the pelvis demonstrating a left total hip replacement and (b) an antero-posterior radiograph demonstrating a left hip hemiarthroplasty.



Figure 4. An intraoperative radiograph showing left hip cannulated screws.

decision therefore depends on a thorough anaesthetic review and, if appropriate, discussion with the patient (White et al, 2014).

Displaced intracapsular fractures

In these fractures, the femoral head has broken off from the neck, meaning that the blood supply to the femoral head will most likely have been disrupted. Even if the fracture is fixed back to its anatomical position, fracture healing can be unreliable. For this reason, the femoral head is usually replaced with a prosthetic implant. National Institute for Health and Care Excellence (2017a) guidance dictates that total hip arthroplasty (Figure 3) should be offered to patients who are able to walk independently outdoors with the use of no more than one stick, are not cognitively impaired, and are medically fit for anaesthesia and the procedure. Patients outside these criteria (that is those who are poorly mobile or cognitively impaired) should be offered hemiarthroplasty (Figure 3) using the anterolateral approach. The implant used should be of a proven design, that is an implant that has at least 10 years of evidence and a revision rate of less than 5% at 10 years (Orthopaedic Data Evaluation Panel, 2014). Bone cement should be used in all cases.

In young patients (<50 years of age), the patient's own femoral head should ideally be preserved to maximise function and to reduce or delay the need for future joint replacement. This can be done by internal fixation with either cannulated screws (Figure 4) or dynamic hip screws (Figure 5).

Undisplaced intracapsular fractures

In these fractures, the femoral head remains attached to the neck, meaning that the blood supply to the femoral head may still be preserved. Although these fractures can be treated non-operatively, there is a risk of secondary displacement and avascular necrosis, and therefore a need for future surgery (Xu et al, 2017). For this reason, non-operative treatment is usually reserved for patients who are medically unfit to undergo surgery. Surgical options



Figure 5. a. Radiograph of the pelvis demonstrating a left dynamic hip screw. b. Radiograph of the right hip demonstrating a short intramedullary nail.

include to try and preserve the femoral head with internal fixation (dynamic hip screws or cannulated screws), hemiarthroplasty or total hip arthroplasty. The most recent review of evidence by the National Institute for Health and Care Excellence (2017b) was unable to demonstrate superiority of any one particular surgical option. Patients should be managed on a case-by-case basis, taking into account age, comorbidities and pre-morbid mobility.

Extracapsular fractures

National Institute for Health and Care Excellence (2017a) guidance dictates the use of a sliding hip screw (such as a dynamic hip screw) (Figure 5) for fractures above and including the lesser trochanter. For fractures with subtrochanteric extension an intramedullary nail (Figure 5) should be used. There is conflicting evidence for the use of short vs long nails. Short nails are faster to perform and may result in reduced transfusion requirement, but long nails may prevent further fracture as no stress risers are created (Dunn et al, 2016; Lindvall et al, 2016; Bovbjerg et al, 2019). Other unstable fracture configurations where an intramedullary nail may be used include multifragmentary, reverse obliquity, incompetent lateral cortex, or where there is a large lesser trochanter fragment.

Postoperative care

Patients who undergo total hip replacement or hemiarthroplasty should have postoperative radiographs to check the position of the prostheses. A check radiograph is not routinely required for patients undergoing internal fixation as an image intensifier is used intraoperatively. Mobilisation should ideally start 1 day post-surgery (Halbert et al, 2007), but there is insufficient evidence to establish the optimal strategy for enhancing mobility after hip fracture surgery (Handoll et al, 2011). Patients with hip fractures have a high risk of developing deep vein thrombosis or pulmonary embolism, because of the significant reduction in their mobility. Therefore, following risk assessment, venous thromboembolism prophylaxis is advised for 1 month. National Institute for Health and Care Excellence (2019) guidelines recommend using either low molecular weight heparin or fondaparinux, provided there is low bleeding risk. Direct oral anticoagulants are not licensed in these patients. Strategies to prevent further fractures play an important role in the management of patients recovering from a hip fracture. These include reducing the risk of further falls through a multidisciplinary falls risk assessment and improving the patient's bone health. 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 (National Institute for Health and Care Excellence, 2016). After discharge from hospital, patients should undergo a wound check at 2 weeks, either in the community or in the hospital if they remain an inpatient. Patients who undergo total hip replacement or intramedullary nailing should return for outpatient clinic follow up, usually after 6 weeks; other patients do not routinely require clinic review after discharge.

Key points

- Hip fractures are common in the elderly, with the predominant mechanism of injury being a fall from standing height.
- Patients who have had a hip fracture often have complex medical needs and require rapid optimisation, early surgery and careful multidisciplinary care.
- Surgery is indicated for almost all patients to relieve pain and promote early mobilisation.
- There are several surgical treatment options, the choice of which is guided by how the blood supply to the femoral head is compromised.

Curriculum checklist

This article addresses the following requirements from the core surgical training and acute care common stem curriculum:

- Common fracture patterns of the lower limb: presentation, management and complications.
- Peri-operative management of emergency orthopaedic patients.
- Knowledge of fractures of the neck of femur.

Conclusions

Patients with hip fractures often have complex medical needs and require rapid optimisation, early surgery and careful multidisciplinary care. Surgery is indicated for almost all patients to relieve pain and promote early mobilisation. There are several surgical treatment options guided by how the blood supply to the femoral head may be compromised by the fracture pattern.

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Conflicts of interest

The authors declare no conflicts of interest.

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