Focus On
Intracapsular fractures of the femoral neck

Introduction
Fractures of the hip have been described as an orthopaedic epidemic with an estimated global incidence of 1.3 million fractures in 1990. This is expected to increase to 4.5 million fractures by the year 2050 with the largest increase anticipated in Asia and Africa. Approximately 50% of these will be intracapsular fractures.

The femoral head has a precarious blood supply. The main supply is from the retinacular vessels, which arise from an arterial ring of small vessels in the trochanteric area. These vessels receive blood from the medial and lateral femoral circumflex arteries. The retinacular vessels from this ring pass proximally along the femoral neck in three groups, posterosuperior, posteroinferior and small, anterior retinacular arteries. In addition, a small supply of blood is from the ligamentum teres as well as vessels within the medullary cavity. It is this precarious vascular supply of the femoral head, in conjunction with the difficulties in achieving a stable fixation of the fracture, which can lead to the high incidence of complications with fracture healing.

The hip fracture classification systems of Garden,1,2 Pauwels3 and the AO4 group have been shown to have a high degree of intra- and inter-observer variation and limited predictive value for complications associated with fracture healing. A simple, acceptable radiological classification of either undisplaced or displaced is preferred.

Undisplaced intracapsular fractures
This term includes fractures that are undisplaced and/or valgus impacted fractures, in which the trabeculae on the anteroposterior (AP) radiograph are orientated more vertically. Conservative treatment of this fracture has been historically described.5 Recent studies have reported a 50% rate of displacement in fractures treated conservatively; internal fixation reduces this risk to approximately 5%, thereby making this the preferred method of treatment.6 Arthroplasty can also be used to treat undisplaced fractures but is associated with an increased mortality and higher rate of complication compared with internal fixation.7

Displaced intracapsular fractures
Conservative treatment of a displaced fracture can lead to a painful nonunion. Therefore, operative treatment is recommended using either reduction and internal fixation or replacement arthroplasty. Each patient with a displaced intracapsular fracture has to be assessed individually to determine the risk and merits of the different methods of treatment. The main factors that will influence this decision are:

1. Age. The risk of fracture nonunion increases in older patients. Nonunion is uncommon in those aged less than 50 years but rises to approximately 40% for patients in their seventies.

In younger patients, aged less than 60 to 70 years of age, the femoral head should be preserved as fracture union is higher and any risk of the long-term complications of arthroplasty are avoided.8,9 However, avascular necrosis of the femoral head is more common in younger patients.

2. Sex. Complications of fracture healing in male patients are approximately half that of females.8,9

3. Pathological fractures. For primary and secondary pathological fractures, arthroplasty is generally preferred.

4. Radiological features of the fracture. Increasing displacement of the fracture on the AP radiograph is associated with an increased risk of fracture nonunion. The estimated degree of osteoporosis, posterior comminution of the femoral neck, angulation at the fracture site and level of the fracture have not been reliably shown to affect fracture healing.

5. Arthritis of the hip. The occurrence of symptomatic arthritis of the hip in conjunction with an intracapsular fracture is rare but, when it does occur, arthroplasty is the preferred method of treatment.

6. Metabolic bone disease. Hyperparathyroidism and chronic renal failure lead to a significantly increased risk of fracture nonunion. Undisplaced intracapsular fractures may be treated by internal fixation but arthroplasty is preferred for displaced fractures as nonunion is invariable after fixation.10

7. Rheumatoid arthritis. An increased risk of complications associated with fracture healing after internal fixation has been reported in patients with rheumatoid arthritis. Therefore, replacement arthroplasty may be more appropriate in these patients.

8. Delay from injury to surgery. Distortion and compression of the vascular supply of the femoral head in displaced intracapsular fractures may cause irreversible ischaemic damage. Some studies have suggested that urgent reduction and fixation within six hours will reduce the risk of avascular necrosis.11 However, other studies suggest that a delay of less than two days is not associated with any notable increased risk of necrosis.12 Consequently, for fractures in which there has been a significant delay from injury to surgery, arthroplasty may be a more appropriate method of treatment.
Internal fixation or arthroplasty for displaced intracapsular fractures
Randomised trials and review articles have reported a lower rate of re-operation and tendency to better functional outcomes in elderly patients undergoing arthroplasty compared with internal fixation. No difference in mortality has been shown between the two procedures.\textsuperscript{13,14}

In summary the advantages of internal fixation compared with arthroplasty are:
1. Allows the patient to retain his or her own femoral head
2. Less surgical trauma compared with arthroplasty
3. Mortality and morbidity may be marginally reduced in very frail patients
4. Reduced risk of sepsis and complications of wound healing

Disadvantages of internal fixation
1. Risk of non-union (approximately 33%)
2. Risk of avascular necrosis (approximately 16%)
3. Increased rate of re-operation compared with arthroplasty (30% to 50% vs 6% to 18%)
4. Tendency to better functional outcomes and less residual pain after arthroplasty

Disadvantages of arthroplasty
1. Increased risk of complications of wound healing (superficial sepsis 5% to 15%, deep sepsis 2% to 3%, haematoma 2% to 5%)
2. Risk of dislocation (2% to 5%)
3. Risk of operative fracture of the femur (2% to 4%)
4. Risk of peri-prosthetic fracture (1% to 3%)
5. Risk of prosthetic loosening (2% to 10%)
6. Risk of acetabular erosion after hemiarthroplasty (4% to 20%)

Internal fixation of intracapsular fractures
Undisplaced fractures require no reduction. Minimally displaced fractures can often be reduced by internal rotation of the limb. For fully displaced fractures, reduction of the fracture is performed first, with the patient on a fracture table and applying controlled longitudinal traction, while screening with the image intensifier in the AP view. Once correct, when fracture alignment has been restored on the AP radiograph, fracture reduction is completed by internal rotation of the limb. For severely displaced fractures full internal rotation of the limb may be required to achieve an acceptable reduction. Failure to achieve a satisfactory closed reduction is uncommon, but in this situation open reduction through an anterior approach to the hip will be necessary.

The ideal reduction is an anatomical or slight valgus position of the femoral head on the AP view with a trabecular angle of 160° to 170°. A varus position must be avoided. On the lateral radiograph, the femoral head, neck, trochanteric region and shaft should be in a straight line. The optimum Garden alignment reduction angles for the AP and lateral radiographs are between 160° and 180°.\textsuperscript{15}

Many different implants are available for the internal fixation of intracapsular fractures. Studies to date show little difference in the outcome for a parallel cancellous screw method versus fixation with a sliding hip screw.\textsuperscript{16} Current practice guidelines require screws to be low to central on the AP radiograph and central or slightly posterior on the lateral view.

Aspiration of the hip joint, to reduce the raised intracapsular pressure caused by bleeding from the fracture site, has been advocated. This high pressure may impede the blood supply to the femoral head by a tamponade effect. While aspiration may be effective in reducing the pressure, it remains unproven if this leads to a reduced incidence of avascular necrosis of the femoral head.

After internal fixation, there is no need to restrict hip movement. Partial weight-bearing may reduce the forces on the hip over the period of fracture healing, but it is not known if this leads to a reduced risk of complications.

Arthroplasty for intracapsular fractures
All randomised trials to date comparing a cemented with an uncemented arthroplasty stem in patients with a hip fracture, have favoured the use of a cemented stem.\textsuperscript{17,18}

Bipolar hemiarthroplasties, with their interprosthetic joint, have the potential advantage of reduced acetabular wear. Unfortunately, these theoretical benefits have not been demonstrated in published randomised trials comparing bipolar with unipolar hemiarthroplasties.\textsuperscript{17}

In a number of clinical studies and randomised trials of hip fracture, total hip replacement has been compared with hemiarthroplasty.\textsuperscript{17} Most of these studies have involved a subgroup of slightly fitter patients, aged 60 to 75 years. Total hip replacement appears to be associated with a slightly increased risk of dislocation but the degree of residual pain and regain of function appears to be better.

References


