Hip dislocations and femoral head fractures

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Abstract

Traumatic dislocation of the hip joint is a rare injury with significant long-term implications for patients. The most common mechanism is a dashboard injury, when the knee impacts the dashboard with force during a high speed road traffic accident. Hip dislocation is a surgical emergency, and early reduction of the hip reduces long-term complications such as avascular necrosis (AVN) and osteoarthritis. Once reduced CT scanning is use to determine the size of the fragment, assess reduction and identify any foreign bodies in the joint. Injuries can then be classified according to the size and location of the fractured fragments. The aim of definitive management is anatomical reconstruction of the femoral head, and reduction of the joint and weight bearing surface. Good outcome can be achieved in patients who have early, stable reduction of the hip. Congruent reduction and fixation of large articular fragments, or removal of small comminuted intraarticular fragments reduces the occurrence of late complications affecting function and quality of life, such as AVN or post-traumatic arthritis. Long-term follow-up is required to identify patients who may need further intervention or revision to total hip arthroplasty in the years following injury.

Keywords Classification; femoral head fracture; hip dislocation; outcome; trauma

Introduction

Traumatic dislocation of the hip joint is a rare injury with potentially significant long-term implications for patients, many of whom are young and active. The most common mechanism is a dashboard injury, when the knee impacts the dashboard with force during a high-speed road traffic accident (RTA). The incidence of these injuries is increasing with more motor vehicle use and they tend to be associated with other significant injuries such as femoral head and neck fractures, acetabular fractures, knee, ankle and spinal injuries.[1] Hip dislocation is a surgical emergency and studies have shown that early *congruent* reduction of the hip reduces long term complications such as avascular necrosis and osteoarthritis.[1,2] Given the rarity of these injuries, a clear management strategy is needed to guide early care as this can have a significant effect on final outcome. Long-term rehabilitation must also consider the multiply injured patient and associated injuries to the hip such as femoral head, neck and acetabular fractures, and patients must be counselled as to the severity of the injury.

Anatomy and pattern of injury

The hip is an inherently stable joint due to its bony and soft tissue anatomy, significant force is required to dislocate it. This often results in associated fractures, either around the joint or elsewhere in the same limb. The femoral head is well contained within the acetabulum by the surrounding soft tissues of the labrum, capsule and ligamentum teres.[3]

The most common pattern of injury is a posterior dislocation. Mechanism such as impact with the dashboard results in axial compression of the femur with the hip flexed, forcing the femoral head out of the back of the acetabulum. Chiron et al reviewed a series of 55 patients with femoral head fracture dislocations.[4] They identified three patterns of injury, which could be determined by the position of the leg at time of impact. With the hip flexed to 90° and forced adduction the compression force in the femur is parallel to the posterior wall of the acetabulum. In this situation, a pure hip dislocation occurs. With the hip flexed and neutral adduction the compression force is perpendicular to the posterior wall. The femur is forced through the posterior wall, either resulting in an acetabular fracture leaving the femoral head intact, or if the posterior wall remains intact shear forces to the medial aspect of the head result in a supra-foveal fracture of half the head leaving a fragment from the inferior side of the head inside the joint. Combined injuries can also occur. Intermediate adduction results in shear forces through the anterior-inferior part of the head, at or above the fovea. In this injury pattern the fragment is usually smaller, one third or less of the head size. Thus the position of the limb at the time of injury dictates the injury received.

Anterior dislocations account for only 10% of hip dislocations. The classic mechanism described is that of a heavy weight falling on the back with legs wide apart, knees straight and back bent forward, such as in miners or manual labourers.[3] However now the most common cause is again high speed RTAs, with posterior force on an abducted and externally rotated hip. They are described by the position the femoral head comes to lie, type I (pubic) with the femoral head superior to the acetabulum, and type II (obturator) with the head inferior.[3] Once identified assessment and management of anterior and posterior dislocations are very similar, with only slight adjustment to the immediate reduction manoeuvres.

Assessment

Isolated hip dislocations are relatively straightforward to diagnose with clinical examination: the leg lies short and adducted, internally rotated and slightly flexed. Diagnosis is then confirmed on pelvic radiographs, usually with the femoral head sitting above the acetabulum. Associated femoral head or acetabular fractures may be apparent on X-ray but further assessment with CT is necessary before planning definitive management. Clinical evaluation becomes more difficult in patients with associated long bone fractures of the same leg, particularly femur. In these cases, the lower limb can be in any position and the injury may not be apparent with standard clinical assessment. In severe

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lower limb trauma x-rays of the pelvis, femur and knee are essential to identify dislocations which may otherwise have been missed. Following diagnosis of a hip dislocation it is essential to carefully document the neurovascular status of the limb prior to reduction.

Immediate management

Once identified hip dislocations must be reduced urgently, ideally within 6 hours of injury. Definite adverse outcomes have been reported if dislocations are left unreduced for 12 hours or more.[2] Closed reduction should be attempted under general anaesthetic. The reduction manoeuvre is like that used to reduce a total hip replacement performed through a posterior approach. The pelvis is stabilized by an assistant while the surgeon applies traction in line with the femur, in the position it lies at presentation. The hip and knee are then gently flexed to 90°, maintaining traction throughout. At 90° the hip is kept under traction and internally rotated and adducted until the joint is reduced.[3] Significant traction is often needed and gradual movements avoid causing or completing fractures of the femoral neck. Stability of the reduction should then be assessed, and radiographs confirm reduction of the joint. These initial X-rays may also show any associated fractures but further imaging with CT scanning is required in all cases.

Two to three failed attempts at closed reduction should prompt immediate conversion to open reduction, as repeated attempts at closed reduction are associated with damage to the articular surface or femoral head, with implications for long term function.[5] If closed reduction is achieved temporary traction provides pain relief and stability whilst awaiting further imaging and surgical planning.

CT

CT scanning is essential in all cases of hip dislocation.[4] However; reduction of the dislocated hip should not be delayed until this is available. CT is used to define associated fractures, determine the size of the fragment, assess the quality of reduction and identify any loose bodies in the joint. This information is then used to classify the injury.

Classification

Several classification systems have been described for hip dislocations and femoral head fractures. Best known for hip dislocations are Thompson and Epstein, and Stewart and Milford. Thompson and Epstein is clinically useful as it helps to plan management. Dislocations are divided into five types, with type V associated with femoral head fractures.

Thompson and Epstein classification of hip dislocation[6]

- Type I: Dislocation with no more than minor chip fragments
- Type II: Dislocation with large single fragment of posterior acetabular wall
- Type III: Dislocation with comminuted fragments of posterior acetabular wall
- Type IV: Dislocation with fracture through acetabular floor
- Type V: Dislocation with femoral head fracture

Femoral head fractures are then further subdivided, of which the most widely used classification was described by Pipkin.

Pipkin classification of femoral head fracture[7]

- Type I: Fracture line inferior to the fovea
- Type II: Fracture fragment includes the fovea
- Type III: As types I and II but with an associated femoral neck fracture
- Type IV: Any pattern of femoral head fracture and an acetabular fracture (coincides with Thompson and Epstein's type V)

Management

Following immediate reduction, the aim of definitive management in any case of hip dislocation or femoral head fracture is anatomical reconstruction of the femoral head, and congruent reduction of the joint and weight bearing surface.[4] The size and location of the fractured fragment has a great influence on functional outcome, and management is therefore guided by the classification of the injury. Due to the rarity of the injury there are few large studies looking at management and outcome, and there is some disparity of the advice in the literature available.

A clear management strategy is needed as traumatic hip dislocation is encountered infrequently, and the treating surgeon is likely to be unfamiliar with the injury pattern. This must also consider associated injuries.

If congruent reduction of the femoral head is achieved, with no significant fractures of the head or the acetabulum as confirmed on CT, non-surgical treatment is indicated (Thompson and Epstein type I). A satisfactory assessment of stability after reduction under general anaesthetic is reassuring. Axial pressure is applied to the femur while the hip is monitored for posterior subluxation on image intensifier. Some authors advise a period of rest of up to 6 weeks in traction, prior to weight-bearing. However, given the functional aims in these often young active patients, most recommend early mobilization with prompt input from physiotherapists and protected weight-bearing.[3]

Treatment for femoral head fractures is surgical, determined by the type of fracture (Figure 1). In Pipkin type I fractures the fracture fragment is not part of the weight bearing surface of the femoral head. The fragment can be safely resected, as this does not have significant effect on the loading zone of the femur, and therefore should not have long-term consequences for functional outcome of the joint.[8] Non-surgical treatment is not recommended in these cases as fracture fragments result in a non-congruent joint surface, pain on mobilization and weight-bearing and later osteoarthritis of the joint.

Type II fractures involve the weight bearing surface of the femoral head, and should therefore be anatomically reduced and fixed to restore the loading area of the femur.[8] This is most often performed with headless compression screws, though the surgical approach to the hip remains controversial (Figures 1 and 2).

Type III fractures are difficult to treat and result in long-term functional problems. In young or active patients reduction and fixation of the fractures should be attempted. However, the blood supply to the femoral head is often significantly compromised and it should be anticipated that hip arthroplasty may be

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