Traumatic Hip Dislocation
A Review

Samuel Sanders, M.D., Nirmal Tejwani, M.D., and Kenneth A. Egol, M.D.

Abstract

Hip dislocations are uncommon injuries that result from high-energy mechanisms. These patients require careful trauma evaluation to rule out concomitant injuries. Early closed or open reduction that is performed within 6 hours and close radiological follow-up is recommended to obtain the best possible results. It is also essential to educate the patient regarding the potential sequelae and follow them for evidence of osteonecrosis and posttraumatic arthritis.

Hip dislocations are infrequent, occurring almost always after a traumatic injury; 85% to 90% of these are posterior dislocations.1 Dislocations of the hip encompass a spectrum of injuries that have considerable potential for long-term disability and rapidly progressing joint degeneration. To dislocate a hip requires massive force. Associated injuries are common and should be screened. These include fractures of the femoral head, femoral neck, acetabulum, or a combination of these.2,3 Time to presentation and, more importantly, reduction of the hip dislocation is essential in treating this injury and minimizing long-term complications, such as avascular necrosis and posttraumatic arthritis. Small cartilaginous or osseous fragments may remain in the joint space, preventing a congruent reduction. In addition, the vascular supply to the femoral head may be irreversibly damaged at the time of the injury. These associated injuries can compromise the likelihood of maintaining a normally functioning hip joint. Sciatic nerve injuries and trauma to more distal aspects of the ipsilateral extremity trauma can affect management and outcome of patients who sustain a hip dislocation (Fig. 1).

Anatomy

The hip is a true ball-and-socket joint in which the head is incompletely covered. Due to the depth of the acetabulum (enhanced by the labrum), its thick capsule, and strong muscular support, the hip joint is less likely to dislocate when compared to other joints in the body, including the shoulder, knee or ankle. The ligamentous support is provided by the strong capsular ligaments that extend from the acetabulum to the femoral neck and the intertrochanteric region. The iliofemoral ligament, or Y ligament of Bigelow, is located anteriorly. The ischiofemoral ligament is located posteriorly. The short external rotators adhere to the capsule posteriorly, providing additional stability. The blood supply to the femoral head has been well described.1 In adults, the main arterial supply is derived from the cervical arteries, which originate from an extracapsular ring at the base of the femoral neck. This ring is formed predominantly by contributions from the medial femoral circumflex artery posteriorly, with smaller contributions from the lateral femoral circumflex artery anteriorly. The capital branches pass through the capsule close to its insertion to lie on the femoral neck; they then ascend up the neck and enter the femoral head just below the articular surface. The superior and posterior cervical arteries are derived primarily from the medial circumflex artery; they are larger and outnumber the anterior vessels. A small

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contribution to the head comes from the foveal artery via the ligamentum teres. With a hip dislocation, whether anterior or posterior, the tenuous blood supply may be compromised, which can lead to osteonecrosis.4

**Mechanism of Injury**

The mechanism of dislocation of the hip has been shown in multiple case studies to be axial loading, most commonly secondary to impact with a dashboard in a motor vehicle crash.2,3,5-8 The direction of the dislocation is dependent on the position of the hip at impact and the direction of the force vector applied.9 The impact on the knee with the hip in an adducted position leads to a posteriorly-directed force, causing a posterior dislocation. In contrast, an anterior dislocation occurs when the hip is abducted and externally rotated.

**Associated Injuries and Pathoanatomy**

Associated injuries include those directly related to the hip dislocation and those secondary to the traumatic incident itself. Injuries to the ipsilateral extremity may include the femoral head, neck, and shaft fractures; acetabular fractures; pelvic fractures; sciatic nerve injury; knee injuries; and foot and ankle injuries.10-12 Knee injuries, including patellar fractures, ligament rupture and knee dislocations are associated with posterior dislocations, due to the direct trauma to the knee. Intra-abdominal, head, and chest trauma have also been reported.4 A high index of suspicion for associated injury must be maintained, and a trauma evaluation is indicated for all patients with a hip dislocation. It should also be noted that associated traumatic injuries may cause a delay in the diagnosis and treatment of the dislocation.4

With hip dislocations, the capsule and the ligamentum teres are usually disrupted. Labral tears and muscular injury can occur as well. With an anterior hip dislocation, the iliopsoas tendon is a fulcrum for the hip, and the capsule is disrupted anteriorly and inferiorly. Posterior hip dislocations result in a tear through the capsule inferoposterior or directly posteriorly, depending on the amount of flexion present. The Y ligament of Bigelow usually remains intact, and the capsule is stripped from its acetabular attachment posterior to it. In some cases, however, the Y ligament may be avulsed from the acetabulum with a fragment of bone.13 Associated fractures of the femoral head are common and

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**Figure 1** A. Asymmetrical bilateral hip dislocations; B. Asymmetrical bilateral hip dislocations, reduced.

**Figure 2** Thompson-Epstein Hip Dislocation Classification System.

**Figure 3** Epstein Hip Dislocation Classification System.
may be the result of impaction injuries, avulsions, or shear fractures. Impaction injuries commonly occur in anterior dislocations.\textsuperscript{1} Avulsed fragments of bone are frequently found attached to the ligamentum teres and lying in the fovea. Posterior dislocations may be associated with acetabular fractures.

### Classification

The first part of any description is the direction of dislocation, anterior or posterior. The classification systems of Stewart-Milford and Thompson-Epstein are the most commonly used (Table 1). These have been found to have prognostic significance, as fractures associated with acetabular or femoral head fractures have a worse prognosis than others (Figs. 2 and 3).\textsuperscript{1,14-16}

### Patient Evaluation

Full trauma survey is essential because of the high-energy nature of these injuries. Many patients are obtunded or unconscious when they arrive in the emergency room as a result of associated injuries. Concomitant intra-abdominal, chest, and other musculoskeletal injuries, such as acetabular, pelvic, or spine fractures, are common. Patients presenting with dislocations of the hip typically are unable to move the lower extremity and are in severe discomfort. The classic appearance of an individual with a posterior hip dislocation is a patient in severe pain, with the hip in a position of flexion, internal rotation, and adduction. Patients with an anterior dislocation hold the hip in marked external rotation, with mild flexion and abduction. The appearance and alignment of the extremity, however, can be dramatically altered by ipsilateral extremity injuries. A careful neurovascular examination is essential, because injury to the sciatic nerve or femoral neurovascular structures may occur at the time of dislocation. Sciatic nerve injury may occur with stretching of the nerve over the posteriorly dislocated femoral head. Posterior wall fragments from the acetabulum have the potential to injure the nerve. Usually, the peroneal portion of the nerve is affected, with little if any dysfunction of the tibial nerve. Rarely, injury to the femoral artery, vein, or nerve may occur as a result of an anterior dislocation. Ipsilateral knee, patella, and femur fractures are common. Pelvic fractures and spine injuries may also be seen.

### Treatment

The treatment of an uncomplicated hip dislocation is aimed at early reduction and avoidance of complications. Urgent reduction of the femoral head is indicated in almost all cases. The incidence of osteonecrosis has been shown to increase if reduction is delayed.\textsuperscript{15,17} A closed reduction under sedation or anesthesia should be attempted in the emergency department unless there is an associated hip or femoral neck fracture. These cases may require a closed reduction in the operating room with general anesthesia or an open reduction.

There are several described techniques for reduction of both anterior and posterior hip dislocations. Regardless of the direction of the dislocation, the reduction can be attempted using in-line traction with the patient lying supine, followed by applying a force opposing the vector of the initial injury. Initially, the traction should be applied in a steady manner to overcome muscular spasms.

### Table 1

**Common Classification Systems of Hip Dislocation**

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<tr>
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<th>Thompson-Epstein Classification of Posterior Hip Dislocation</th>
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<tbody>
<tr>
<td>Type I</td>
<td>Simple dislocation with or without an insignificant posterior wall fragment</td>
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<tr>
<td>Type II</td>
<td>Dislocation associated with a single large posterior wall fragment</td>
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<tr>
<td>Type III</td>
<td>Dislocation with a comminuted posterior wall fragment</td>
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<tr>
<td>Type IV</td>
<td>Dislocation with fracture of the acetabular floor</td>
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<tr>
<td>Type V</td>
<td>Dislocation with fracture of the femoral head (Pipkin Class)</td>
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<th>Epstein Classification of Anterior Hip Dislocation</th>
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<tr>
<td>Type I</td>
<td>Superior dislocations, including pubic and subspinous</td>
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<tr>
<td>IA</td>
<td>No associated fractures</td>
</tr>
<tr>
<td>IB</td>
<td>Associated fracture or impaction of the femoral head</td>
</tr>
<tr>
<td>IC</td>
<td>Associated fracture of the acetabulum</td>
</tr>
<tr>
<td>Type II</td>
<td>Inferior dislocations, including obturator, and perineal</td>
</tr>
<tr>
<td>IIA</td>
<td>No associated fractures</td>
</tr>
<tr>
<td>IIB</td>
<td>Associated fracture or impaction of the femoral head</td>
</tr>
<tr>
<td>IIC</td>
<td>Associated fracture of the acetabulum</td>
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<tr>
<th></th>
<th>Stewart-Milford System</th>
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<tr>
<td>Type I</td>
<td>Simple dislocation without fracture</td>
</tr>
<tr>
<td>Type II</td>
<td>Dislocation with one or more rim fragments but with sufficient socket to ensure stability after reduction</td>
</tr>
<tr>
<td>Type III</td>
<td>Dislocation with fracture of the rim producing gross instability</td>
</tr>
<tr>
<td>Type IV</td>
<td>Dislocation with fracture of the head or neck of the femur</td>
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and elastic restraints with counter traction exerted by an assistant to stabilize the pelvis. The preferred method is to perform a closed reduction under general anesthesia; if this is not feasible, reduction under intravenous sedation is possible. Femoral neck fractures may be caused by overly enthusiastic reduction maneuvers, which include the following:

1. Allis Method: Traction is applied in line with the deformity. The patient is placed supine, with the surgeon standing above the patient on the stretcher. Initially, the surgeon applies in-line traction, while the assistant applies counter traction, stabilizing the pelvis. While increasing the traction force, the surgeon slowly increases the degree of flexion to approximately 70°. Gentle rotational motions of the hip and slight adduction will often help the femoral head clear the lip of the acetabulum. A lateral force to the proximal thigh may assist in reduction. An audible “clunk” is a sign of a successful closed reduction.

2. Stimson Gravity Technique: The patient is placed prone on the stretcher, with the affected leg hanging off the side of the stretcher. This brings the extremity into a position of 90° of both hip and knee flexion. In this position, the assistant immobilizes the pelvis and the surgeon applies an anteriorly directed force on the proximal calf. Gentle rotation of the limb may assist in reduction.

3. Bigelow and Reverse Bigelow Maneuvers: These methods have been associated with iatrogenic femoral neck fractures and are not as frequently used as reduction techniques. In the Bigelow maneuver, the patient is supine and the surgeon applies longitudinal traction on the limb. The adducted and internally rotated thigh is then flexed to at least 90°. The femoral head is levered into the acetabulum by abduction, external rotation, and extension of the hip. In the reverse Bigelow maneuver, used for anterior dislocations, traction is again applied in the line of the deformity. The hip is then adducted, sharply internally rotated, and extended.

Approximately 2% to 15% of hip dislocations are irreducible. In anterior dislocations, this may be due to buttonholing through the capsule or interposition of the rectus, capsule, labrum, or psoas. In posterior dislocations, the piriformis, gluteus maximus, capsule, ligamentum teres, labrum, or a bone fragment may prevent reduction. If the hip is irreducible, urgent open reduction is recommended. If possible, Judet views, inlet and outlet views of the pelvis, and a computed tomography (CT) scan should precede the procedure to identify concomitant bony injury and possible obstructions to reduction.

Following closed reduction, post-reduction radiographs should be obtained to confirm adequate reduction. The hip should be examined for stability, while the patient is still sedated or under anesthesia. If a displaced acetabular fracture is found or a posterior wall fragment greater than 33% is identified, the stability examination need not be performed, as operative fixation is warranted. Stability is assessed by flexing the hip to 90° in neutral position. A posteriorly directed force is the applied. If any subluxation is detected, the patient will require additional diagnostic studies and possibly surgical exploration or traction. After successful closed reduction and completion of the stability examination, the patient should undergo a CT scan to assess for any acetabular or femoral head pathology and evaluate for any loose bodies within the hip joint. If the hip is unstable, then skeletal traction is used.

**Operative Management**

The absolute indications for open reduction include irreducible dislocations and nonconcentric reductions with intra-articular fragments of bone or cartilage. Furthermore, the majority of dislocations are associated with acetabular fracture and some femoral head fractures. Irreducible dislocations should be treated as surgical emergencies. Open reduction should be approached from the direction that the hip dislocated. Posterior dislocations are addressed via a Kocher-Langenbach approach. The sciatic nerve should be protected, and direct exposure of the impediments to reduction is accessible. The acetabulum should be examined for loose bodies and the femoral head evaluated for chondral damage prior to reduction of the hip. After the joint has been cleared of loose bodies and or soft tissue, the hip is reduced. If an associated posterior-wall fracture less than 20% exists, stability testing is required, with fixation of these fragments as needed. After confirmation of reduction, the bony, capsular, and soft tissue injuries are repaired.

Irreducible anterior dislocations are addressed via an anterior (Smith-Petersen) or an anterolateral (Watson-Jones) approach. The direct anterior approach will allow better visualization of injuries to the anterior aspect of the hip joint and femoral head fractures. The anterolateral approach permits access to the posterior hip through the same skin incision if needed. The operative approach is based on the associated lesions and surgeon preference.

Excision of intra-articular of loose fragments of bone or cartilage, especially if the reduction is not concentric, is another indication for surgery. Small fragments that are seen in the fovea and do not impinge on the head need not be removed. This finding is common and usually represents a small piece of bone avulsed from the femoral head by the ligamentum teres. Fragments that require excision are interposed between the articular surfaces of the head and the acetabulum. Hip arthroscopy has recently increased as a treatment modality for various conditions, including femoracetabular impingement, labral pathology, and presence of loose bodies. Diagnostic arthroscopy is carried out in a supine position through anterior and anterolateral portals. Small intra-articular fragments that do not require fixation may be removed arthroscopically and labral pathology addressed. Using this technique, distraction of the hip joint is needed to debride the joint, and additional vascular insult to the head may be avoided.
The final indication for surgery is an unstable fracture-dislocation, which requires operative fixation of the acetabular fracture. Often, an examination under general anesthesia (EUA) is necessary to assess stability. Since clinical instability leads to repeated subluxation and chondrolysis or arthritis, determining stability is essential. If more than 20% of the posterior wall of the acetabulum is fractured, controlled stress testing should be performed. If an open reduction is being performed, direct examination of the hip should be done at the same time. If a closed reduction is performed, fluoroscopy will be helpful in assessing stability. The patient is positioned supine. The hip is flexed to 90° and internally rotated while a posterior force is applied.

**Post-Reduction Management**

Strict immobilization leads to intra-articular adhesions and arthritis and, therefore, should be avoided. Some investigators recommend a temporary period of traction or balance suspension until the patient’s initial pain has subsided, but this has not been proven beneficial. After this, controlled passive range-of-hip motion exercises and early mobilization are thought to benefit the patient’s overall condition. Extremes of motion should be avoided for 4 to 6 weeks to allow for capsular and soft-tissue healing. Our protocol allows for full weight-bearing, as tolerated, and avoidance of hip flexion past 90°. Although early weightbearing has not been shown to add to the initial ischemic insult, it is believed that the amount of collapse in patients who develop osteonecrosis may be diminished if weightbearing is delayed.

Rehabilitation should include strengthening exercises for the musculature about the hip. Return to high-demand activities and sports should be delayed 6 to 12 weeks or until hip strength is near normal.

**Outcome**

In general, anterior dislocations without femoral head injury have a better long-term prognosis than posterior dislocations. Other variables have been associated with poorer outcomes, likely secondary to inducing osteonecrosis or arthritis. Associated injuries have a negative prognostic effect on the clinical result. The most important prognostic factor has been presumed to be the time to reduction.

Osteonecrosis of the femoral head can occur after a hip dislocation and is a poor prognostic indicator of clinical outcomes. Previous studies have documented an osteonecrosis rate of 4.8% in patients who were reduced in less than 6 hours, whereas a 52.9% rate was seen in hips reduced after 6 hours from injury. Weightbearing was not shown to have a significant effect on osteonecrosis in this study. Patients should be followed with imaging to monitor for signs of osteonecrosis. When osteonecrosis occurs, it usually appears within 2 years of the injury, but has been observed as long as 5 years after injury.

Arthritis is the most common complication in patients who have sustained a traumatic hip dislocation. Posttraumatic arthritis has been shown to occur in up to 24% of patients; those who have a sedentary lifestyle have lower rates after 14 years of follow-up. Those involved in heavy manual labor after traumatic accidents were shown to have up to 37.5% incidence of posttraumatic arthritis. The damage to the chondrocytes at the time of the injury has been hypothesized to be responsible for the incidence of late arthritis after dislocation. It is important to counsel patients about the long-term sequelae of these injuries.

Sciatic nerve injuries are more common after fracture-dislocations when compared to pure dislocations. These injuries are usually partial and most often affect the peroneal distribution. Resolution after reduction of the dislocation is the rule, and exploration is not required unless nerve function was intact before the reduction and then lost afterward.

**Conclusion**

Hip dislocations are uncommon injuries that result from high-energy mechanisms. These patients require careful trauma evaluation to rule out concomitant injuries. Early reduction, within 6 hours, and close radiological follow-up, is recommended. It is also essential to educate the patient regarding the potential sequelae and follow them for evidence of osteonecrosis and posttraumatic arthritis.

**Disclosure Statement**

None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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