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Traumatic Hip Instability

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Traumatic hip instability is a relatively rare phenomenon related primarily to the inherent anatomical stability of the hip joint. As this clinical condition can go unrecognized, it can be a source of significant disability. Hip instability causes pain with possible joint unsteadiness due to extraphysiological hip motion. Although instability can arise from an atraumatic etiology, a traumatic event often causes the presenting injury. Traumatic hip instability can present as a spectrum from subluxation to frank dislocation with associated bony or soft tissue injuries. Recently, hip arthroscopy has gained popularity as both a diagnostic and a therapeutic tool in treating hip pathology, including the injury patterns associated with hip instability.
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Introduction

Traumatic instability of the hip joint has historically been considered to be a rarely encountered clinical condition, but that general belief has been slowly changing as more research into these injuries, and the hip in general, is being performed. Owing to the fact that this is not a frequently encountered condition for most clinicians, there is controversy regarding ideal diagnostic and management strategies. Even if these injuries are diagnosed and managed optimally, they can still have devastating consequences for affected patients. In most cases, relatively high-energy injuries are necessary for true dislocation events to occur, due in large part to the significant osseous conformity between the femoral head and acetabulum. Lower energy mechanisms can still be responsible for subluxation or dislocation injuries. Atraumatic instability of the hip joint is distinct from the condition of traumatic dislocation or subluxation, and represent a separate pathologic pathway. Owing to the nature of the combined damage to the bone, cartilage, and soft tissue envelope, surgical approaches must be carefully thought out to appropriately treat the complex pathology encountered.

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Hip Anatomy

The anatomy of the hip joint is complex, and underpins current understanding of the relative stability of the hip. The femoral head and acetabulum form a diarthrodial joint, which is conchoid in nature, and they are highly congruous with approximately 170° of femoral head coverage.[1] The acetabulum is oriented with 48° of lateral cephalad tilt and 21° of anterior tilt or anteversion, which creates more posterior osseous coverage and restraint to posterior translation.[2] Alterations in the bony morphology of the hip, in the form of developmental hip dysplasia, a relatively retroverted acetabulum, or femoral-acetabular impingement (FAI), can produce a hip with less inherent stability, and may also produce injuries to the soft tissues and cartilage structures around the hip.

Serving to increase the acetabular surface area by 25% and acetabular volume by 21% is the labrum, which is a fibrocartilage structure that attaches to the acetabular rim. The labrum functions to enhance the stability of the hip in part through the creation of the suction-seal effect at the hip joint.[3] Intra-articular injury in the substance of the labrum or at the chondrolabral interface can affect the stability of the hip joint. Biomechanical studies have demonstrated that labrum tears alter the kinematics of the hip, with alterations in contact areas as well as contact pressure.[4] In addition, the hip fluid seal function of the hip is diminished with damage to the labrum,

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which decreases its ability to maintain the negative intra-articular pressure and restraint to joint distraction.[5,6]

In addition to the labrum, there are a number of other static stabilizers of the hip. The fibrous capsule contains several areas that are reinforced with discrete sections of stronger, thickened tissue that have been described as ligaments, with reliable anatomical locations and physiological functions. The capsule itself is the strongest anteriorly, and less robust posteriorly and inferiorly.[1] The strongest and most anterior of these is the iliofemoral ligament, also referred to as the "Y Ligament of Bigelow" because of its single origin along the anterior inferior iliac spine and broad, dual insertion along the intertrochanteric line on the femur.[7] This ligament primarily serves to stabilize the hip in extension and external rotation, preventing anterior translation.[8] The pubofemoral ligament originates along the superior pubic ramus and courses to insert along the neck of the femur as well as blend with the distal fibers of the iliofemoral ligament.[9] Here, the ligament functions to limit extremes of extension and abduction, as well as limit external rotation in this position.[10] The third of the main capsular ligaments is the ischiofemoral ligament, which exists on the posterior aspect of the joint. This ligament originates proximally at the ischial border of the acetabulum and inserts distally at the base of the greater trochanter.[9] The main function of this particular structure is to limit posterior translation and internal rotation, and it aids in the joint being most stable in full extension.[10] Associated with these ligaments is a circular structure referred to as the zona orbicularis. Portions of the iliofemoral ligament and pubofemoral ligament coalesce into the zona orbicularis, whose fibers run circumferentially around at least the posterior portion of the femoral neck.[8] The zona orbicularis lies along the thinnest portion of the hip joint capsule itself, and functions to resist longitudinal distraction.[11] The ligamentum teres originates from the acetabular fossa adjacent to the transverse acetabular ligament, and inserts into the fovea capitis on the femoral head. This structure becomes more taut in external rotation of the femur along with flexion. There is a debate on the stabilizing function of the ligamentum teres, but there is evidence for a secondary function, particularly in distraction.[12] The iliopsoas muscle functions as a dynamic stabilizing force on the anterior aspect of the hip joint. The muscle passes over the anterior capsule as it heads from its origin at the lumbar spine to the insertion along the lesser trochanter. The muscle can be placed under increased load during athletic activity, and it may also become inflamed and produce internal coxa saltans symptoms in patients with instability.[12]

Clinical Presentation

Traumatic hip instability represents a spectrum of injuries. Acute complete hip dislocations typically present in a relatively direct fashion, whereas subtler subluxation injuries may be more difficult to diagnose. Because of this, it is important to obtain a thorough history regarding the hip pain, which should provide clues regarding the appropriate diagnosis. Most of the hip dislocations and subluxation injuries related to traumatic instability are posterior in nature, with anterior instability being diagnosed much less frequently. Posterior instability is usually the result of higher-energy trauma such as a motor vehicle collision where the knee strikes the dashboard, or lower energy injuries such as a direct fall onto the knee with a flexed and adducted hip, a position of relative vulnerability. Anterior instability may be caused by a blow from behind with a hip in full extension and external rotation.[9] Certain sports have been linked directly to traumatic hip instability, including football, skiing, gymnastics, rugby, biking, hockey, basketball, and soccer.[12-16]

Patients with acute traumatic dislocations may present in several different ways. If the hip remains dislocated, it would be typically observed in a flexed, adducted, internally rotated, and slightly shortened position with the more common posterior dislocation. If the dislocation is anterior, the hip would be extended, abducted, and externally rotated.[9] An acute dislocation should be recognized quickly and treated as quickly as possible to provide a concentric reduction of the hip joint in an effort to reduce the risk of avascular necrosis (AVN).[17] A patient who sustained a traumatic dislocation with spontaneous reduction or a subluxation event would present with more subtle complaints. If the subject complains of hip symptoms related to mechanical clicking, catching, locking, giving way, or discomfort in positions or activities that would place the hip in a potentially unstable position, they should undergo prompt evaluation for instability.[18] A thorough history of the patient's hip complaints, including activities that may have caused the initial injury, is important. Complete medical and family history may reveal potential sources of soft tissue laxity and potential joint instability such as Ehlers-Danlos syndrome, Marfan syndrome, or Down syndrome.[18] Additionally, hip as well as groin pain may be reported from several other areas of the body. Lower back and lumbar spine pathology may cause pain in distributions around the buttock, lateral thigh, and groin, extending to the anterior and medial thigh. Pain in the hip and groin area can also be due to pathology primarily from the gastrointestinal and genitourinary tract systems along with vascular causes. Abdominal wall weakness, athletic pubalgia, and frank hernias are also a common source of groin pain in active patients.[19]

Physical Examination

Physical examination findings in patients with traumatic hip instability are variable. In patients with frank dislocations, the typical leg position may be observed. In this situation, or in a patient complaining of symptoms related to a less obvious injury, the first step should be a complete and thorough neurovascular examination, with particular attention paid to the sciatic nerve function, which is at particularly high risk with posterior instability events. Documenting any observed motor or sensory deficits before further examination or attempt at closed reduction is important at this stage. With a dislocated hip, the patient is in considerable pain and may be unwilling to move the hip joint and the remainder of the lower extremity, and the limb is positioned in the typical position as described earlier. Closed reduction, sedation, or general anesthesia may be appropriate, and there are several different described