Review Article

Management of hip and groin pain in American football players

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Abstract: Fractures, dislocations, muscle and tendon strains, athletic pubalgia, contusions, and femoroacetabular impingement (FAI) are common injuries in American football players and range in severity from minor to major due to the high energy collisions, but have not been comprehensively reviewed. Athletes with preexisting FAI are more prone to hip subluxation and dislocation as well as intra-articular pathology. Although stress fractures are the most common osseous issues, femoral neck and pelvis fractures have the risk for high amounts of morbidity. Musculotendinous injury and contusions are the most common injuries in football with goals of return to play being based in maintaining motion and progression to strengthening. American football hip injuries are unique and can be quite severe due to high energy collisions. Prompt and appropriate management is key to prevent long term morbidity and shorten safe return to play.

Keywords: American football; myotendinous injury; athletic pubalgia; contusions; femoroacetabular impingement (FAI)

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Introduction

Contact athletes, specifically American football players, represent a unique population in regards to hip injuries. In particular, they are more prone to trauma than other non-contact athletes. Five common mechanisms of hip injury in football players are: (I) fracture, subluxation, and dislocation; (II) myotendinous injury; (III) athletic pubalgia; (IV) contusions; and (V) femoroacetabular impingement (FAI) related injury. Each of these common pathologies has important diagnostic criteria as well as immediate and delayed treatments to improve safe return to play.

Fractures, subluxation and dislocation

Femoral neck, acetabulum, and pelvic ring fractures usually occur due to overload of normal bone in athletes. A common type of fractures in football players are stress fractures. One study found that stress fractures occur in 1% of the general population and 20% of contact athletes (1). This incidence is thought to occur from long duration and intense repetitive exercise, causing osteoclasts to resorb bone, which leads to an imbalance in the ability to reform bone. Insufficient nutritional intake can further worsen this balance. Some also believe abnormal femoral neck bony morphology and muscle weakness may predispose athletes to stress fractures (2).

Although rarer, high energy impact injury can cause acute fracture involving the hips and pelvis. Femoral neck fracture is the most concerning acute fracture in this young population due to the risk of osteonecrosis and the high morbidity associated (3). Acetabular fractures also may occur, particularly those of the posterior wall, which can lead to long term complications including posttraumatic arthritis. One National Football League (NFL) study found posterior wall fractures to be 45% of all intra-articular hip injuries (4). Plain radiographs are the initial investigation modality to evaluate acute fractures. Sclerosis and periosteal

reaction may also be seen. Magnetic resonance imaging (MRI) is often helpful for diagnosis of occult fracture, seen as decreased signal on T1 and increased signal on T2 images, or soft tissue injury. If a stress fracture is suspected, particularly of the femoral neck, MRI is recommended (1).

Return to play is determined by fracture type and its inherent stability. For example, non-displaced acetabular wall fractures of less than 20%, and non-displaced compression sided inferior femoral neck fractures, can many times be managed with restricted weight bearing. Similarly, activity modification usually is the treatment of choice in pelvic ring and sacral stress fractures. Contrarily, fractures that are displaced, of the acetabular dome, large acetabular wall, and tension sided femoral neck fractures are best treated operatively followed by restricted weight bearing. Rehabilitation consists initially of graduated joint loading and gentle hip and core strengthening progressing to higher impact activities and return to sport drills. Return to play ranges from 3–6 weeks with stress fractures while surgically treated pelvis fractures require approximately 4 months (4). Nutrition and hormonal influences, although rare in football players, should be investigated in players with stress fractures.

Hip instability is uncommon in football players when compared with other joints, such as the knee or shoulder, due to the hip's congruency. Most commonly, these occur acutely and posteriorly during direct impact on a flexed and adducted hip. Subluxations are less common and usually occur in patients who have underlying hyperlaxity or abnormal bony morphology (5,6). Careful neurovascular examination is important as sciatic nerve function may be impaired with posterior dislocations. A single immediate attempt at reduction, before muscle spasm, may be performed. Otherwise, radiographs should be obtained to evaluate for concomitant fracture. Post-reduction plain radiographs, as well at CT and MRI are important to evaluate any intra-articular pathology and to rule out fracture and soft tissue injury. If any loose bodies are found in the hip joint, surgical removal is imperative to prevent post-traumatic arthritis. In simple hip dislocations, flat-foot weight bearing is required for a minimum of 6 weeks while passive range of motion is done. After full range of motion is regained, strengthening with an emphasis on lumbopelvic stability should be done and full return to sport typically is 3–4 months and no earlier than 2 months (4).

Complications of fracture and dislocation can be career ending. Femoral head osteonecrosis may occur subsequent to hip subluxation or dislocation. One case report found osteonecrosis in two professional football players, leading to total hip arthroplasty (7). Extended return to play is expected in these traumatic injuries. Many suggest MRI 6 weeks after injury to screen for early signs of osteonecrosis and other intra-articular pathology. If signs of osteonecrosis are found, toe-touch weight bearing for a minimum of 6 more weeks is recommended, as well as close observation (5).

Muscle and tendon strains

Myotendinous injuries are very prevalent in all sporting activities and are one of the most common reasons for missing time. These injuries are more common when an extreme increase in intensity of activity occurs, typically during the pre-season. Hip strains of the rectus femoris, hip adductors, and rectus abdominis are common injuries about the hip (8).

The rectus femoris is usually injured during sprinting or kicking. Injury of the direct head and reflected head as well as the central tendon can occur; the greatest time lost being associated with injury to the direct head (9). Avulsions in which the tendon is retracted may require surgery. Heterotopic ossification is a risk with these injuries and can lead to chronic groin pain, impingement, and limited hip flexion. One study of 11 NFL players with rectus femoris avulsions treated non-operatively returned to play in 6 to 12 weeks (10).

Quadriceps strains and rupture occur usually during eccentric lengthening, commonly at the myotendinous junction. Fascial injury can lead to muscle herniation and chronic issues as well.

Hamstring strain and rupture are very common in contact athletes due to rapid eccentric lengthening with high loads. Severity may vary significantly from time lost ranging from a few days to 8 weeks (11,12). Reinjury also is very common.

Hip adductor strains are less common in football players when compared with cutting sports such as hockey and soccer, with the adductor longus being the most commonly injured. These injuries are self-limited and return to play usually occurs within 1 to 2 weeks.

Most of these injuries are exacerbated with increased activity, as they are commonly overuse injuries, and palpation commonly is the best tool to pinpoint the location of injury. Palpable defects with adjacent soft tissue bruising is commonly seen with avulsions, while tenderness or swelling in the mid portion of a muscle is common with a strain. Further, resisting the muscle's action can pinpoint the location of injury as pain is usually exacerbated. For

example, hamstring strains are painful with resisted knee flexion. Plain radiographs should be obtained to evaluate possible avulsion fractures in injuries at the hip or knee, but generally are not needed otherwise. MRI can be useful in severe myotendinous and avulsion injuries. These injury patterns may be seen concomitantly. One NFL study found that adductor strains, labral tears, and rectus strains are common in rotational and axial loads to the hip in high impact injury and coined it "sports hip triad" (4).

Treatment of strains include initial rest, ice, compression followed by pain-free muscle stretching as it is important to maintain full motion of the hip and knee and to minimize swelling (13). Next, soft tissue techniques to restore muscle length and eccentric strengthening are undertaken leading to return to play when painless sports activity is possible. Surgical treatment is commonly recommended in complete hamstring avulsion of 2 or more tendons with greater than 2 cm of retraction, complete distal quadriceps rupture, chronic proximal adductor pain, and chronic painful proximal hamstring rupture (14). Surgical treatment of proximal hamstring avulsions and distal quadriceps injury involve initially immobilization for 4–6 weeks followed by isometric exercises and gentle, pain-free stretching with concentric and eccentric strengthening beginning around 3 months and return to play around 6 to 9 months (2).

Athletic pubalgia

Rectus abdominis and abdominal musculature injury can occur and radiate into the groin region. The term athletic pubalgia is commonly used when discussing sports related injury. This is a general term which refers to a range of groin injuries and definitions vary. It commonly is used interchangeably with the term sports hernia. Sports hernia is the tearing of the posterior inguinal wall without a clinically recognizable hernia and is only symptomatic during activity. It presents as insidious onset of unilateral deep groin pain, which worsens by movements and increases in abdominal pressures. These injuries occur by trunk hyperextension and thigh hyperabduction, which leads to shearing across the pubic symphysis. These shear forces on the inguinal wall musculature cause attenuation and tearing. Recent studies have found intra-articular hip pathology to be common in these patients with the thought that they are at higher risk for abdominal injury due to their decreased motion hip (15,16). Conservative treatment begins with nonsteroidal anti-inflammatory drugs (NSAIDs), rest and massage progressing to lower abdominal and hip strengthening, specifically optimizing abductor to adductor strength ratios. In select cases, open and laparoscopic hernia repair have been shown to be successful, with return to play approximately 3 months post-operatively (17). It has yet to be defined which patients are better suited for laparoscopic repair and which are better suited for an open repair. Further, there is a subset of patients with combined athletic pubalgia and FAI who may benefit from combined hip arthroscopy and sports hernia repair (18).

Contusions

Muscle contusions are the second most common injury in the collision athlete behind muscle strains (4). The most common contusion location is the quadriceps muscle due to its ease in sustaining a direct blow to the anterior thigh. Hip pointers are also very common in football players and occur from a direct blow to the iliac crest or the greater trochanter. Due to the subcutaneous location of these bony prominences, painful swelling occurs in both the surrounding soft tissues and bone with a large range in time missed (4). Morel-Lavallee lesions consistently cause a greater amount of disability as they are a degloving injury caused by the traumatic blow occurring in line with the tissue planes, leading to shearing and separation at the fascial layer. The lateral thigh is a common location for Morel-Lavelle lesions in football players due to the proximity of the greater trochanter (19).

Each of these conditions leads to bruising, tenderness to palpation, and pain with contraction of the affected muscle. Morel-Lavelle lesions display a fluctuance over the injured area. Imaging is of little value in most circumstances unless a large hematoma is suspected. MRI may provide utility in localizing a hematoma that can be aspirated with ultrasound.

Management is similar to that of muscle strains with a focus on motion, excluding the use of soft tissue techniques, then strengthening with return to play typically in less than 1–2 weeks. Hip pointers can be injected with an anesthetic agent and padded for game play. Morel-Lavelle lesion treatment consists of compression, in an attempt to decrease the dead space, and icing. Some require aspiration of fluid and sclerodesis, and rarely surgical evacuation of fluid (19).

FAI

FAI is a group of symptomatic hip disorders related to underlying structural anatomy of the hip joint injury and is

commonly caused by either cyclic loading or acute injury during repetitive activities of daily living or athletics. The common mechanism of abutment between the proximal femur and the acetabular rim most commonly occurs at the anterior-superior region of acetabular rim. This repetitive collision between femoral head-neck junction and acetabular rim precipitates labral injury, chondral delamination, and a degenerative cascade.

Cam impingement occurs when the femoral head is aspherical with decreased femoral offset and decreased head-to-neck ratio. This morphology is most common in young athletic males. The impingement occurs when the prominence on the superior lateral portion of the femoral head impacts the anterolateral labrum during hip flexion and internal rotation, which can occur commonly during cutting. This conflict leads to shear and compression of the chondrolabral junction, which can cause delamination and subsequent labral tears. Pincer impingement occurs when an enlarged bony prominence forms on the anterolateral acetabulum. Pathology is seen when impaction occurs between the enlarged acetabular rim and femoral head-neck junction with the labrum being squeezed between. Often patients may have mixed cam and pincer morphologies.

Symptoms of FAI are exacerbated with deep squatting, or activities which involve hip hyperflexion. These include vague groin pain, while popping, clicking, and catching are common in labral tears. These symptoms are particularly noticeable with internal and external rotation at 90 degrees of hip flexion. Groin pain with passive hip flexion, adduction, and internal rotation (FADIR) is sensitive for intraarticular pathology and has been coined the impingement test.

Anteroposterior (AP) pelvis and lateral hip radiographs are the initial test of choice to evaluate acetabular version and coverage as well as femoral head and neck morphology. Assessment for a crossover sign, indicating a retroverted acetabulum, or a cam lesion of the femoral head and neck increase the possibility of impingement. MRI is the mainstay to evaluate labral, cartilage, and surrounding soft tissue structures.

Diagnostic image guided intraarticular injections can be helpful to determine if the source of the pain is intraarticular and if surgical intervention may be of benefit. Core and hip muscle strengthening and avoidance of hip flexion beyond 45 degrees during training are suggested in these pathologies. Additionally, soft tissue massage to decrease hip flexor irritation and hip joint mobilizations may provide symptomatic relief. Many times, surgical intervention is the best option for long term improvement of symptoms. Surgical treatments range from open to arthroscopic and include femoral head osteoplasty, acetabuloplasty, labral repair and reconstruction, and soft tissue debridements. Post-operative rehabilitation is important with return to play typically occurring between 4–6 months post-operatively (2).

Summary

Fractures, dislocations, muscle and tendon strains, athletic pubalgia, contusions, and FAI are common injuries in football players and range from minor to major due to the high energy collisions. Athletes with preexisting FAI are more prone to hip subluxation and dislocation as well as intra-articular pathology. Although stress fractures are the most common osseous issues, femoral neck and pelvis fractures have the risk for high amounts of morbidity. Musculotendinous injury and contusions are the most common injuries in football with goals of return to play being based in maintaining motion and progression to strengthening. American football hip injuries are unique and can be quite severe due to high energy collisions. Prompt and appropriate management is key to prevent long term morbidity and shorten safe return to play.

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Footnote

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