

Femoroacetabular Impingement in the Adolescent Athlete

Femoroacetabular Impingement (FAI) is a condition in the hip theorized to be a potential precursor to osteoarthritis in the joint [7]. Its relative recent discovery and correlation leaves much to be desired at this time. It was not until the early 2000's that this group of bony deformities were correlated appropriately within the orthopedic community. For this reason, there is much to learn as the medical community moves forward. FAI is categorized in three different fashions. First is a cam lesion which is associated with an abnormality on the femoral neck or head, second a pincer lesion is over-coverage of the acetabular rim, while the last category includes both of the previous deformities.

FAI has been associated with many different conditions so far and most often has been diagnosed in life beyond the scope of this class [7, 11]. After discussion with a hip specialist and through the research conducted, the author has concluded this timeline is due in large part to misdiagnosis and conservative diagnosis and treatment. Byrd reported FAI affects young athletes when they push their bodies beyond their physiologic limits [8]. With the increase in sports activities in youth and adolescent patients, it can be presumed that the rate of intense activities also increases.

Prevention

Prevention remains unknown at this time. Unlike other injuries such as anterior cruciate ligament or shoulder injuries, there are no formal programs designed to prevent FAI [4]. Due to the nature of the condition and its incomplete etiological knowledge, the value of such program cannot be evaluated at this time. Strength programs emphasizing core strength and stability along

with lower extremity strength may be incorporated into future prevention programs.

Additionally, these exercises will most often improve athletic performance.

Anatomy

The anatomy of the hip, in this author's opinion, is one that is not fully understood and subsequently often mistreated. To the untrained individual it is often easy to mistake key landmarks which ultimately lead to misdiagnosis and mistreatment. Identifying the correct pathology is paramount to successful treatment leading to subsequent lifestyle recommendations.

The hip is a ball and socket joint which allows for extensive range of motion in many different planes. It is closely related to the glenohumeral joint in the shoulder, however the hip's femoral-acetabular junction is more stable than its counterpart. This is due to the deep acetabulum which is a feature of the pelvis and the labrum which further deepens that fossa. The head of the femur then fits into that fossa and is held in place by ligaments and the labrum. The glenohumeral joint has a much shallower fossa associated which in turn leads to increased mobility needed for its daily and sport activities. The hip consists of a multitude of musculature and only the major muscle groups are listed here. Those include the hip flexors (iliacus, iliopsoas, and psoas), the hamstrings (semitendinosus, semimembranosus, and biceps femoris), the adductors (brevis, magnus, and longus), and the glutes (medius, minimus, and maximus).

The cam lesion is an aspherical development on the femoral head typically on the anterior aspect which during hip flexion collides with the rim of the acetabulum causing a shearing force on the labrum. Damage in this impingement case is associated with flexion [9]. This type of lesion has most often been seen in male athletes in the adolescent population.

The pincer lesion is said to be over-coverage of the acetabular rim on the femoral head. Once again, in end-range hip flexion this extra coverage causes the femoral neck to collide with

the rim and causes the shearing force on the labrum. It has been described most often in female adolescent athletes.

Mechanism of Injury

FAI is considered to be a chronic condition that many believe is likely congenital [1]. The pain is often insidious, but may be associated with some form of trauma that elicits the pain [5]. Due to the anatomy of the hip and in this case, abnormality, repetitive hip flexion is believed to be a major cause for the symptomatic presentation. In the pediatric patient, this individual is going to report participating in extensive high-intensity activities with repetitive movements [8]. These athletes may participate through pain for an extended period of time depending on their pain tolerance. Other causes that have been theorized include hip fractures, Legg-Perthes Disease, and Slipped Upper Femoral Epiphysis (SUFE) [1].

Symptoms

The pain that a patient will experience is going to vary. This has often complicated the diagnosis because there are multiple symptom paths one may follow. In addition, this has often led to misdiagnosis of a variety of conditions. Due to this misdiagnosis, improper treatment can be provided which not only delays proper treatment, but can add great expense. A typical location for pain is the anterior groin [5]. Further history may note inflexibility reported by the patient which would be documented in the physical exam [8]. A labrum tear is often associated with FAI [7]. This leads one to consider further investigation if a labrum tear is suspected.

Physical Examination

The physical examination must include all aspects of a normal orthopedic exam including range of motion, strength testing, and special tests. The examiner can expect to measure noticeable limitation with internal rotation and elicit increased pain at end-range hip flexion. The

anterior impingement test is said to be one of the greater indicators of FAI. This special test is conducted with the patient in a supine position and the hip is brought into full flexion and full internal rotation. It is said to be a positive test when this movement elicits reproducible pain that is the same as what a patient reports [8]. Another special test that is often used is the FABER test. It, too, is done with the patient supine and the affected leg is brought into a position of flexion, abduction, and external rotation. A positive test is when the distance from the lateral aspect of the knee to the exam table is less than that on the contralateral hip. The FABER test is nonspecific, however, because it is also often used in the examination of other conditions such as low back pain. Possibly one of the most telling signs of FAI is subjectively when the patient is asked to locate the pain. The patient often will make a C shape with his or her hands and place it in a cup around the joint [6, 8]. These positive signs all lead to a need for further evaluation.

Imaging and Diagnostic Testing

Diagnostic testing and imaging plays a large role in the final diagnosis of FAI. The physical exam can lead one to conclude it, but there is still some form of subjectivity present in that examination. Imaging such as a magnetic resonance image (MRI) with or without contrast is often ordered to either confirm or rule out the initial diagnosis.

Treatment

The treatment for one suffering from chronic hip pain is going to start conservatively. The clinician is likely going to first treat some sort of muscle injury that may or may not even truly exist. This could be a quadriceps strain, an adductor strain, or a hip abductor strain. Treatment for Iliotibial band friction stress syndrome may also be attempted. These treatments could consist of strengthening, soft tissue massage, or forms of electrical modalities along with ice and/or heat.

Failed conservative treatment will warrant further investigation by the physician which will probably result in diagnostic testing being completed. Even after this is completed, the surgeon may elect to continue conservative treatment and alleviation of pain through restrictions in activity. Research found that many patients were able to manage pain through restriction of activity [2]. This, however, is not likely to occur with the pediatric population without sacrificing hobbies, sports participation, and potentially long-term health. For this reason, it is often necessary to consider more aggressive treatments. This is often found in the form of hip surgery. Arthroscopy is growing in popularity for the treatment of a labrum tear and subsequent FAI correction. This procedure, however, is invasive and delicate. Surgical procedures fall outside the scope of this paper.

Rehabilitation after arthroscopy is going to be extensive and require significant one-on-one time with a physical therapist or athletic trainer. This clinician will most likely be provided with a protocol from the surgeon detailing timelines and limitations for that individual patient.

Initial restrictions will include no external rotation. This is needed to allow that incisions to heal without stress being applied. Post-operatively the patient will often be put into a brace called a hip abduction pillow. Also, this patient will be non-weight bearing or partial weight bearing for 10-14 days or longer. Exercises will begin isometrically for the first several days and then will progress into more active movements as healing is taking place. Flexion will also be restricted for the first few weeks in order to not stress the surgical site. Passive range of motion will begin immediately and many patients are prescribed a continuous passive motion (CPM) machine will extended use at home.

The correlation of core strength and lower body injury has been established and as such core strengthening is integral to the treatment for all lower extremity injuries [10]. The hip's

association with the core and the lower extremities provides further need for core strengthening and stability programs to be incorporated in all phases of rehabilitation.

As strength and range of motion are returned to normal pain-free, more functional activities including half-squats, lunges, and eventually running will be introduced. Eventual return to play must also be considered during the rehabilitation process. Rehabilitation will progress as tolerated by the patient and allowed by the physician's protocol. Most patients will experience a 4-6 month recovery time from surgery to return to full sports participation.

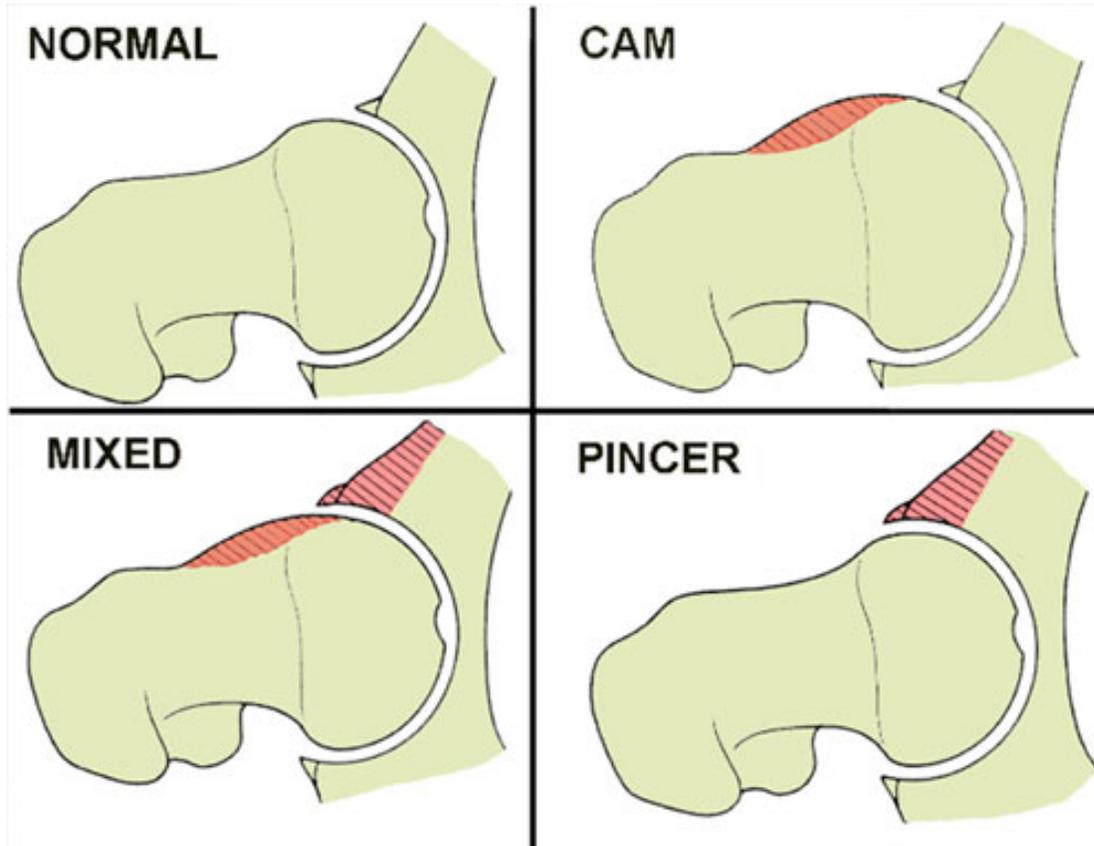
Long-Term Implications

Undiagnosed or mistreated FAI is believed to be a cause for osteoarthritis later in life. This pain can be debilitating and eventually lead to hip replacement. The long-term success or failure of the osteoplasty remains unseen and will remain unseen for some time. Further research to track patients will be necessary to fully grasp the implications post-surgical.

Femoroacetabular impingement, or FAI, is a recently diagnosed bone deformity in the hip joint. Its relationship with osteoarthritis remains theorized, but unproven at this time. The successful diagnosis and treatment whether surgical or nonsurgical also remains unknown in the pediatric patient. It has begun to become more prevalent and this author believes that increased awareness will lead to increased diagnosis. This could lead to better prognoses for not only short-term athletic endeavors but also long-term health in the hip joint and in the total body.

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Different Forms of Impingement



<http://www.jointpain.md/images/fais.jpg>

Symptoms

- Gradual Onset of Groin pain
- Inflexibility
- Possible popping
- Reported “giving out”

Treatment

- Manual Therapy
- Strengthening of Core and Hip Muscles
- Surgical Repair and Debridement

Associated Conditions

- Labrum tears
- Leggs-Perthes Disease
- Slipped Upper Femoral Epiphysis
- Osteoarthritis

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