Research Paper Review

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Femoroacetabular Impingement in Athletes: Current Concepts

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ABSTRACT

Hip disorders are increasingly recognized as a cause of dysfunction and disability among athletes. Femoroacetabular impingement (FAI) is a common source of hip problems. While FAI may sometimes be present as an incidental asymptomatic finding, substantial secondary joint damage may occur. This problem is often observed in young adult, and even adolescent, athletes. FAI morphology results in a breakdown of the labrum and articular surfaces from forces generated during sporting activities that would otherwise be well tolerated by a normal joint. A description of the pathomechanics is included. Detection of pathological FAI is important to minimize its harmful effects. The history, examination findings, and pertinent imaging studies are detailed. Nonoperative measures, including training modifications and pelvic stabilization exercises, may be of some benefit in modulating symptoms. When secondary joint damage has occurred, surgical intervention is usually necessary. While most can be managed with arthroscopic techniques, open and mini-open methods are discussed as well. With proper recognition and treatment, most athletes can expect to return to sports, although the long-term implications of high-level activities must still be considered. These results are summarized.

ANALYSIS

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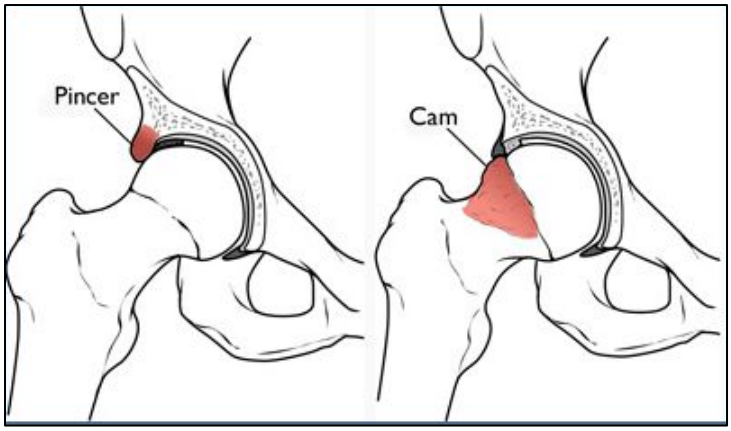
Background Information
Abnormal hip morphology is considered a major factor contributing to the development of early-onset osteoarthritic changes in this joint (in the fourth and fifth decades). Femoroacetabular impingement (FAI) is one such condition, often implicated as a cause of hip pathology in young athletes as early as their second and third decades. The term femoroacetabular impingement refers to the process by which a misshapen hip joint secondarily leads to a breakdown of the intra-articular structures, causing pain and associated dysfunction, followed by the premature development of osteoarthritis. Three types of FAI have been identified: pincer, cam and combined pincer/cam.

Pincer impingement is caused by an excessive prominence of the anterolateral rim of the acetabulum, either from overgrowth of the anterior edge or retroversion of the acetabulum itself. During hip flexion, pincer impingement results in the prominent rim of the acetabulum crushing the labrum against the femoral neck.

Cam impingement can be a consequence of a slipped capital femoral epiphysis and refers to the cam effect of a non-spherical femoral head rotating within the acetabulum. During hip flexion, the femoral head rotates into the acetabulum and creates a shear force on the anterolateral edge of the acetabular surface, resulting in failure of the acetabular cartilage.



FAI is often implicated in non-descript groin pain suffered by many high level athletes but, with improved diagnosis and understanding, the rate of athletes returning to high level competition has improved in recent years. This paper provides a summary of the clinical management of FAI with recommendations for assessment, diagnosis and management.

SUMMARY

General Assessment Considerations

Assessment of the hip region must include evaluation of the hip joint itself, but also screening for co-existent conditions, compensatory disorders and coincidental findings.

Hip joint disease and lumbar spine disease often coexist, especially in sports where rotational velocity is at a premium, such as golf or baseball. Likewise, the sports hernia (also called athletic pubalgia) commonly presents as groin pain which can be confused with pain of hip origin (1).

As hip disorders often go undetected for a protracted period of time (2, 3), athletes often continue in competition and develop compensatory actions, which lead to increased biomechanical stress. The root cause of the disorder must therefore be identified early to allow for the appropriate treatment.

Coincidental findings such as snapping of the iliopsoas tendon or iliotibial band occur in approximately 10% of the population (4) and would be expected to occur in similar proportion in an athletic population. Thus, clinicians must be able to determine if hip symptoms are resulting from hip pathology, or from something more benign such as the snapping of a tendon.

History

When attempting to diagnose or rule out FAI, clinicians must consider several factors in their athletic (and other) patients:

- Hip pain is often gradual in onset;
- Athletes with hip abnormalities often report a history of decreased flexibility when compared with teammates/competitors;
- Athletes often demonstrate the "C-sign" (cupping of the hand above the greater trochanter with the fingers gripping into the anterior groin) while describing the pain associated with hip conditions.

In general, mechanical symptoms associated with intra-articular hip lesions are characterized by sharp, intermittent pain; catching, locking or clicking; and are often precipitated by rotational movements. Maximal flexion is uncomfortable for the patient and extension of the flexed hip against resistance often elicits pain.

Physical Examination
Physical examination can often elicit evidence of hip joint irritability; however, the examiner may not be able to recreate the level of forces across the joint that the athlete can generate during practice or competition (5). The trademark of FAI is diminished internal rotation, although this finding is not definitive. Two tests are valuable when investigating cases of possible FAI:

- The log-roll test (internally and externally rotating a supine patient's entire leg) is not terribly sensitive (i.e. it will miss some cases), but is specific for FAI, as it rotates only the femoral head.
- The anterior impingement test (forced flexion, adduction and internal rotation), which can elicit symptoms associated with FAI.

Several factors should also be considered when testing for FAI:

- Secondary factors are often present due to compensatory changes, e.g. lateral pain from trochanteric bursitis.
- The anterior groin, lower abdomen and adductor region must be carefully palpated to localize tenderness indicative of athletica publagia (1).
- Pain with passive flexion and internal rotation is more indicative of an intra-articular source.
- Snapping of the iliopsoas tendon is elicited by bringing the hip from a flexed, abducted and externally rotated position to extension with internal rotation.

Imaging
Radiographs may be warranted in cases where improvement is not noted quickly, or where diagnosis requires confirmation. Definitive diagnosis is difficult however, as pincer impingement is often assessed on a supine radiograph and it is uncertain how this can be extrapolated to the orientation of the pelvis during standing. In addition, positioning of the pelvis is influenced by the curvature of the spine; and the shape of cam lesions is variable, further complicating radiographic diagnosis.

MR imaging is helpful in diagnosing FAI, as it helps to visualize the soft-tissue damage (e.g. labral tears) and swelling associated with FAI. MRI with gadolinium demonstrates greater sensitivity at detecting intra-articular abnormalities.

CT is superior at showing the bony structures and architecture (6), with three-dimensional reconstructions providing the clearest images of FAI morphology.

Prevention of FAI
There are currently no formal prevention programs for FAI. Some athletes have abnormally shaped hips (impingement morphology) that do not necessarily develop secondary joint damage (impingement pathology). As a result, the value of prevention programs is unknown and requires further investigation.

Non-operative treatment
Non-operative treatment begins with an emphasis on early recognition. The cornerstone of treatment is to identify and limit activities that precipitate symptoms. The bony nature of FAI limits the effectiveness of treatments aimed at improving mobility. Core strengthening is important to allow the athlete to properly compensate for lack of range of motion without compromising adjacent structures.

Surgical treatment

Open surgical dislocation

The open dislocation technique was the first surgical approach described for FAI (7) and has shown good results in returning athletes to pre-injury status (8, 9). The majority of patients treated with this approach; however, are professional athletes and the high rate of return to play noted in this population may reflect other variables, such as motivation, that are not present in non-professional athletes.

Mini-open method with concomitant arthroscopic surgery

This approach was popularized to avoid problems associated with the trochanteric osteotomy used in open surgical treatment (10). The procedure is often used by surgeons as they transition to full arthroscopic techniques, although one study (11) did demonstrate a 55% return to play rate for athletes treated with this approach.

Arthroscopy

Arthroscopic surgery is used both as a treatment option and as a diagnostic method. Several studies (12-17) have demonstrated excellent return to play rates, reporting up to 95% return to play rates for professional athletes. The majority of studies; however, focus on professional or high-level collegiate athletes. Studies focused on amateur athletes have not published details of return to play rates.

CLINICAL APPLICATION & CONCLUSIONS

Femoroacetabular impingement is a common cause of joint damage among athletes. Recognition of this entity and the development of arthroscopic techniques to address it have allowed many athletes to resume their athletic careers. However, surgical intervention can never restore a truly normal joint. As a result, emphasis on early recognition is important in attempting to identify possible cases and provide treatment prior to development of significant pain and dysfunction.

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