

## **PELVIS AND HIP**

Abstract ID:

631

Session: MRI of Professional Athletes (Tuesday 13 May 2014)

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This talk will review the anatomy, biomechanics and injury processes that occur in the pelvis focussing on the hip joint, symphyseal region, surrounding muscles and tendons.

### **Overview;**

1. Anterior pelvis and groin pain.
2. Hip pain - presenting concepts and showing features of femeroacetabular impingement and surrounding soft tissue injuries.
3. Most relevant bone stress and musculotendinous injuries.

### **Imaging Patterns and Appearances in Longstanding Groin Pain in Athletes**

Conventional x-rays, ultrasound and CT do not typically add significant diagnostic information for athletes with chronic athletic groin pain. Degenerative changes; pubic body/apophyseal irregularity, marginal spurring and sclerosis are common and non-

specific in terms of current or previous symptoms. Herniography and isotope bone scans are now rarely performed with the latter, in particular, superseded by MR imaging.

*MR Imaging of Athletes with Chronic Athletic Groin Pain.*

There is marked clinical overlap in terminology and this has also spread into the terminology used in radiology studies of athletes with chronic groin pain.

Oedema, be it in the pubic body bone marrow or parasymphyseal soft tissues, seems to be the most consistent finding in symptomatic athletes. A secondary cleft sign has also been described which is thought to be a partial soft tissue disruption at the junction of the symphysis pubis joint capsule and the adductor/rectus abdominis tendons and aponeuroses.

Two patterns of pubic bone and parasymphyseal oedema are typically seen in elite soccer players.

Pattern 1.

In this pattern which in our experience seems to occur in younger soccer players (aged 14-18 years) MR imaging typically shows moderate to marked bone marrow oedema involving the majority of both pubic bodies and sometimes extending into the rami (Figure 9). There is often high signal fluid in the joint itself with soft tissue oedema diffusely parallel to the pubic bone cortices in the surrounding tendons and muscles fibers but no actual soft tissue disruption. This appearance is less common than the second pattern and differs from that typically seen in chronic athletic groin

pain in that the oedema is more extensive (both in the bone marrow and soft tissues) and symmetrical (see below).

## Pattern 2

This pattern is the most common seen on MR imaging particularly in elite soccer players and is much more localised in comparison to pattern 1. In this pattern pubic bone marrow oedema is asymmetrical in terms of one side affected more than another and can be much more focal with localisation to the subcortical bone marrow in the anteromedial pubis. There is also oedema involving the adjacent anterior capsule, capsular ligaments and the enthesis of the common aponeuroses of adductor longus and rectus abdominis. These oedematous changes can commonly extend into the adductors inferiorly. Oedematous changes are visualised on the oblique axial T2 weighted images and on the coronal STIR images where the capsular and enthesal change has also been described as the secondary cleft sign when there is associated partial tearing of these capsular structures.

Occasionally, despite the use of modern scanners and coils, these changes are sometimes best appreciated as enhancement on post gadolinium sequences. This may be explained by the injury process, at that time, predominantly consisting of granulation tissue which although not oedematous is more vascular than normal capsular and enthesal tissue.

Similar to other modalities symphyseal irregularity, spurring, fatty pubic marrow change, cysts and mild oedematous change are commonly seen in asymptomatic athletes and therefore of limited diagnostic use.

## **FEMEROACETABULAR IMPINGEMENT (FAI)**

FAI develops because of abnormal femoral and acetabular impingement involving the labrum either due to a primary acetabular deformity (termed ‘pincer’) or, more commonly in athletes, due to a prominence of the femoral head and proximal neck (termed ‘cam’). A mixed pattern is often present but there is usually cam dominance in athletes.

The primary imaging technique for FAI is MR arthrography although there are recognised limitations in the assessment of cartilage. Non-arthrographic MR studies rely predominantly on PD weighted fat suppressed sequences. Radial or oblique axial sequences (parallel to the long axis of the femoral neck) should be performed to assess femoral morphology.

These techniques along with improvements from 3T systems will be presented.

### **Osseous Stress Injuries and Musculotendinous Injuries**

Imaging strategies for MR imaging are no different for assessing and diagnosing these injuries than elsewhere in the body but the most significant and common injury patterns will be illustrated.

#### **Further Reading;**

1. Robinson, P., V. Bhat, et al. (2011). "Imaging in the assessment and management of athletic pubalgia." Semin Musculoskelet Radiol **15**(1): 14-26.
2. Pfirrmann, C. W., B. Mengiardi, et al. (2006). "Cam and pincer femoroacetabular impingement: characteristic MR arthrographic findings in 50 patients." Radiology **240**(3): 778-785.
3. Branci S, Thorborg K, Nielsen MB, Holmich P. Radiological findings in

symphyseal and adductor-related groin pain in athletes: a critical review of the literature. Br J Sports Med 2013 Feb 12.

4. Brennan D, O'Connell MJ, Ryan M, Cunningham P, Taylor D, Cronin C, et al. Secondary cleft sign as a marker of injury in athletes with groin pain: MR image appearance and interpretation. Radiology 2005 Apr;235(1):162-7.