

Femoro-acetabular impingement

An early diagnosis is essential in femoro-acetabular impingement (FAI) to permit timely intervention and thus enable a rapid return to activity and limit long-term damage to the hip joint

Case report 1

A 26-year-old male, senior GAA hurler presented with a two-year history of progressive pelvic and bilateral thigh stiffness following activity. The stiffness was often associated with an ache around the front of the right hip and occasional sharp pain extending into the right groin, and would last a couple of days following training or playing a match. There was a history of bilateral hamstring tightness and general inflexibility of the legs compared with others on his team. There was a history of intensive involvement in both hurling and football from a young age, often

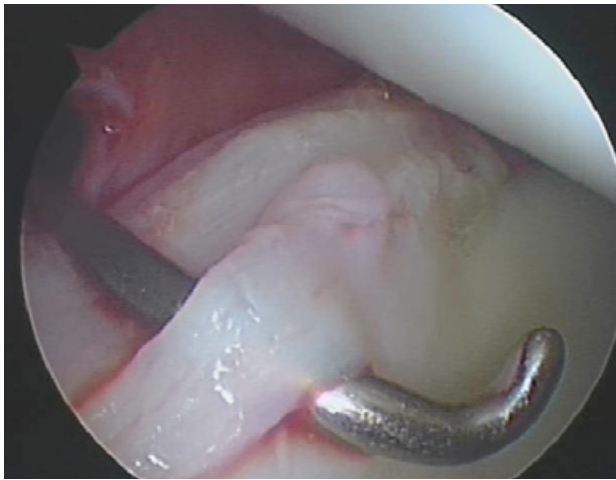


Fig 1: An arthroscopic view of the undersurface of the labrum in a right hip; the probe has been passed through a large tear in the substance of the anterior labrum.

playing and training for club, school and county at the same time.

Clinical examination revealed limitation of motion and groin pain with passive internal rotation and adduction of the flexed hip (impingement test), and restriction of straight leg raising due to hamstring tightness, bilaterally.

Investigations, including x-rays and an MRI arthrogram of each hip, confirmed bilateral femoro-acetabular impingement (FAI) with the presence of a labral tear and damage to the articular cartilage of the acetabular rim. Bony abnormalities (CAM and pincer deformity) were present on both sides of the joint.

Hip arthroscopy was performed to remove the CAM and pincer deformities and repair the acetabular labral tear. Significant scuffing and fibrillation of the articular surface was lightly debrided. The patient returned to full competitive hurling 10 weeks following successful surgery.

Case report 2

A 37-year-old female recreational runner presented with severe intermittent groin pain with a feeling of catching in her left hip. The hip would 'click' regularly especially when putting on shoes and socks and she mentioned that there was a reduction in range of motion of her left hip compared with her right. She could no longer run and pain was present when driving, sitting and during the night.

Clinical examination revealed a reduction of flexion, external rotation and abduction of the left hip (FABER manoeuvre). All other movements were normal. Groin pain was aggravated with hyper-flexion

and with internal rotation of the flexed and adducted hip (impingement test).

X-rays and an MRI arthrogram were performed which confirmed a localised pincer deformity of the acetabular rim in a hip joint with mild dysplasia (shallow socket). A large, detached labrum was observed with good preservation of the articular cartilage.

Hip arthroscopy was undertaken where the small pincer deformity was removed and the detached labrum was securely repaired to the acetabular rim. The patient noticed an almost immediate relief of pain and catching, and returned to recreational sports three months following surgery.

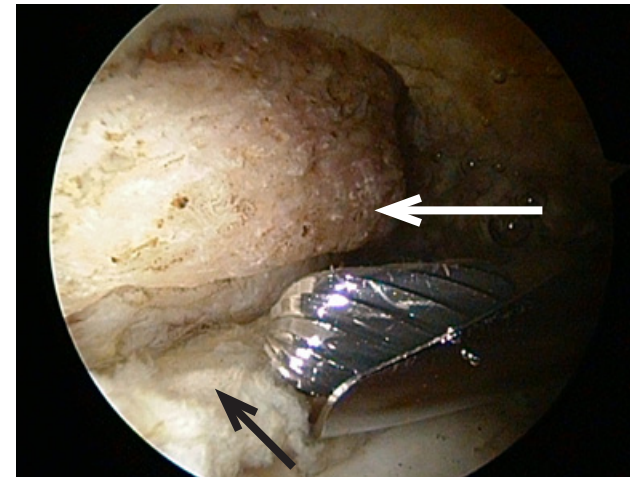


Fig 2: An arthroscopic photograph revealing a large pincer deformity (white arrow) prior to removal with an arthroscopic burr. Note labrum safely reflected away from acetabular rim (black arrow).

Discussion

FAI is now well recognised as a major cause for acute and chronic groin pain in young, active adults. Early diagnosis is essential to permit timely intervention to enable a rapid return to activity but more importantly to limit the progressive damage to the hip joint, which may otherwise result in premature osteoarthritis of the hip, in many cases leading to the need for hip replacement.

Since the term 'femoro-acetabular impingement' was conceived by Reinhold Ganz and his colleagues in 2003, the concept has gained enormous support as being the primary underlying cause for the development of osteoarthritis of the hip joint. As interest and research in this

area has grown, it has become more apparent that the bony abnormalities resulting in hip impingement develop during the teenage years in many young, active patients. Evidence of bony deformity has been documented in children as young as 10 years of age.

The relationship between hip impingement and chronic groin pain in sports is rapidly becoming well recognised. Over the past five years, interest from the international media in this area has intensified concerns on the negative effect that regular competitive sports and training in underage athletes may have on the health of the hip joints.

The two case reports above provide examples of the typical presentation of FAI in young, active adults.

FAI results from the abnormal repetitive contact between the femoral head/neck and the rim of the acetabulum. Progressive bony deformity leads to poor clearance between the head and socket during hip movements – primarily flexion, internal rotation and adduction. The bony deformity can occur on the femoral head and is known as a CAM deformity (Fig 3) or as a prominence of the rim of the acetabulum known as a Pincer deformity (Fig 4). Most patients will exhibit a combination of both pincer and CAM deformity known as 'mixed' impingement (Fig 5).

CAM impingement

Case report 1 describes the classical presentation of a young, active male with CAM impingement. A high intensity of sports may place significant strain on the femoral growth plate during the teenage years, resulting in a 'subclinical slip' of the epiphysis. This leads to flatten-

ing of the anterolateral region of the femoral head and a loss of 'offset' with the anterior femoral neck. The head is no longer perfectly round and during regular flexion and rotation (twisting and turning sports) the head makes abnormal contact on the rim of the acetabulum and this results in progressive damage to the labrum (seal) and the articular cartilage of the acetabular roof. Reactive changes in the bone on both sides of the joint make the CAM deformity more prominent and a pincer deformity develops on the rim of the acetabulum. Tearing and detachment of the labrum results in groin pain and progressive articular cartilage damage results in stiffness and tightness post activity.

Pincer

Case report 2 describes the classical presentation of pincer impingement, most typically found in middle-aged, active females. Pincer impingement results when there

is a global or localised prominence of the rim of the acetabulum, which results in abnormal contact with the femoral neck in flexion and rotation of the hip. Repetitive abrasive trauma to the labrum results in bruising, tearing and eventual detachment from the bony rim; this causes catching and groin pain.

For the majority of patients, pincer impingement develops as a consequence of a naturally deepened acetabulum or due to variations in the natural orientation of the acetabulum; retroversion (less forward facing) places the front rim of the acetabulum in a position of increased contact with the femoral neck. Localised pincer abnormalities can often be found in patients with mild or moderate dysplasia – the uncovering of the femoral head results in increased bone formation at the front of the acetabulum in an attempt to improve stability, but paradoxically results in pincer impingement.

Symptoms

Symptoms generally include many of the features of the two classical presentations above. CAM impingement is more common, presenting mainly in young, active males. Often the first sign of impingement is stiffness around the hips and thighs, but can also affect the lower back. The stiffness increases with duration and intensity of the activities and can last into the evening and often taking a day or two to recover. Loss of speed, agility and flexibility often follow. Groin discomfort and severe hip pain may develop and it is at this stage that many patients present to the clinic, as they can no longer play their sports.

Pincer impingement classically presents with catching and a feeling of instability or giving way in the hip associated with sharp intermittent groin pain. Other symptoms include difficulty in 'crossing the legs' and a reduction in active movements of the hip (flexion, external rotation and abduction). Pain prevents activities such as running or walking, and eventually affects sitting and driving.

As the majority of cases are 'mixed' impingement, a combination of these classical symptoms often exist. Table 1 lists the most common presentation of symptoms.

Table 1: Presenting symptoms in 454 patients diagnosed with FAI

Nature	Percentage
Pain after activity	76%
Pain during activity	68%
Stiffness after activity	65%
Limping after activity	51%
Clicking	51%
Stiffness at rest	43%
Constant limping	9%

CAM

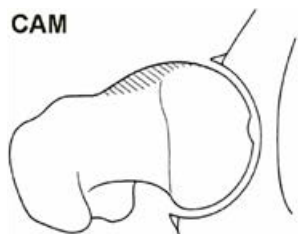


Fig 3: CAM deformity

PINCER

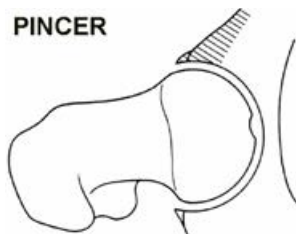


Fig 4: Pincer deformity

MIXED

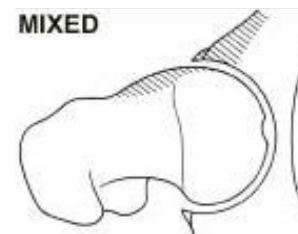


Fig 5: Mixed deformity

Examination

Assessment of the range of movement of the hip joint in patients with FAI will classically demonstrate a restriction in flexion, adduction and internal rotation during passive movements. It is important to perform an impingement test (Fig 6) by bringing the hip into flexion, internal rotation and adduction to establish whether groin pain results. This manoeuvre engages the CAM deformity of the femoral head against the rim of the acetabulum placing pressure on any labral pathology present. If pain re-

sults, then the impingement test is positive. Females with global over-coverage of the femoral head (deep socket) may also have a significant reduction in flexion, external rotation and abduction, known as the FABER manoeuvre (Fig 7).

Straight leg raising will often be restricted in many patients due to hamstring tightness; adductor tightness may restrict abduction. A full examination of the groin and thigh is undertaken to rule out alternative common causes of groin pain such as 'Gilmore's groin' (sports her-

nia), adductor tendinopathy and iliopsoas bursitis.

Investigations

With x-rays, a standard AP pelvis view is required as a baseline to assess the joint space and to rule out early osteoarthritis. An assessment of the degree of retroversion of the acetabulum can be made by looking for the posterior spine of the acetabulum and presence of a crossover sign (overlapping of the anterior and posterior acetabular walls). A pistol grip deformity may indicate a CAM deformity or previous mild slipped

epiphysis. Cystic changes in the femoral head or acetabular rim can be observed as well as any developmental abnormality such as Perthes' disease, developmental dysplasia of the hip (DDH) or the presence of os acetabuli or rim fractures.

Additional views are required to fully assess the hip joint for impingement. A Dunn view and false profile view are special views permitting the anterolateral femoral head to be observed to determine the size of a CAM deformity and the anterior acetabular rim to be clearly visu-



Fig 6: During the impingement test, the hip is passively flexed, adducted and internally rotated; if pain is reproduced in the groin the test is positive

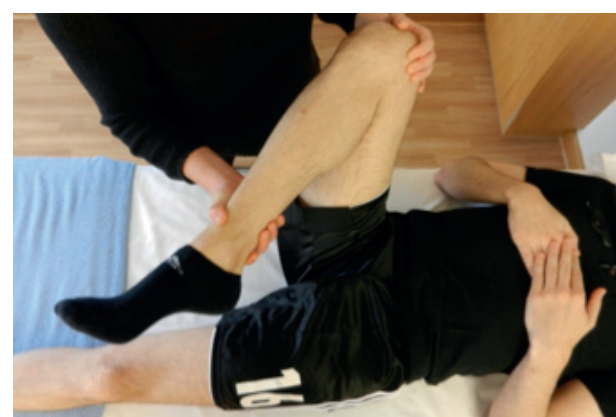


Fig 7: The FABER manoeuvre testing flexion, abduction and external rotation. Distance from knee to table may be recorded and compared to contralateral side

alised for the presence of pincer deformity, respectively. These views are used post-operatively to ensure all deformities have been adequately removed.

An MR arthrogram is the investigation of choice for looking specifically at the presence of a labral tear or detachment, as well as assessing the chondral surface for articular damage. It involves placing water-soluble contrast into the hip joint prior to MRI scanning and it has a higher sensitivity and specificity than plain MRI.

Treatment

Physiotherapy, activity modification and rest periods may temporarily improve pain and stiffness, but once symptoms are present, surgery is generally indicated. The principles of surgery are to remove all of the bony deformities and repair torn or damaged soft tissue structures within the joint. This is performed most commonly using arthroscopic surgical techniques. The operation typically lasts one hour and 15 minutes; patients usually stay one night in hospital and follow a specific rehabilitation programme with an expected return to running after six weeks and sports-specific training at 10 weeks.

Good clinical outcome from surgery has been widely reported in the international journals. Repairing the labrum in an attempt to preserve and optimise its sealing and stability functions has been shown to be superior to debridement or resection in a number of recent studies. The earlier hip impingement is diagnosed and treated in symptomatic patients, the less likely damage to the articular cartilage will be significant and the better the outcome from surgery. Arthroscopic labral repair performed at the Whitfield Clinic has demonstrated a statistically significant improvement in all outcome measures at a minimum one year follow up for patients with FAI.

FAI is a condition that is increasingly being recognised as a major cause for chronic hip and groin pain, and stiffness in the young and middle-aged active adult. It is a progressive condition, which in many cases may cause irreversible damage to the articular cartilage of the hip joint leading to osteoarthritis and the premature requirement for hip replacement. Early diagnosis and timely surgical intervention is important for successful long-term outcome.

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