

Arthroscopic treatment of femoroacetabular impingement

Femoroacetabular impingement is a recently recognized pathological entity. Arthroscopic treatment, as a modern and minimally invasive technique, has become an attractive and promising treatment.

Femoroacetabular impingement is the abutment between the proximal femur and the acetabular rim (Myers et al, 1999). There are three types of femoroacetabular impingement: the cam type in which the source of impingement is the non-spherical femoral head; the pincer type, in which there is overcoverage of the femoral head by the acetabulum; and the mixed type, which is a combination of cam and pincer femoroacetabular impingement. It comprises a distinct pathological entity in the hip joint and is commonly found in young athletic adults (Crawford and Villar, 2005). Studies have shown that this lesion can cause acetabular cartilage damage and consequent osteoarthritic changes (Ganz et al, 2003; Tanzer and Noiseux, 2004). Arthroscopic treatment has become a widely acceptable method and, as a minimally invasive procedure, its popularity has increased in recent years (Khanduja and Villar, 2006).

Historical perspective

Femoroacetabular impingement was first described by Meyers et al in 1999, although it was reported as early as 1936 as 'the impingement of the femoral head to the anterior acetabular margin' (Smith-Petersen, 1936). Ganz et al (2001) successfully used an open procedure to decompress femoroacetabular impingement (Lavigne et al, 2004). The need for quick rehabilitation in high-class athletes led to the use of hip arthroscopy for the excision of the lesion (Crawford and Villar, 2005). Although initially this was considered impossible (Burman, 1931), hip arthroscopy has evolved, technical difficulties have been overcome and clinical expertise has increased (Baber et al, 1999; Khanduja and Villar, 2006).

Aetiology

The so-called cam lesion is characterized by an abnormal osteocartilaginous prominence located at the anterolateral femoral head-neck junction (Zebala et al, 2007). This can be created by a variety of things, including

slipped capital femoral epiphysis, femoral head avascular necrosis and flattening, previous fracture of the femoral neck, Legg-Perthes-Calvé disease, elliptical femoral head, decreased femoral anteversion, or an abnormal separation of the proximal femoral epiphysis (Snow et al, 1993; Goodman et al, 1997; Rab, 1999; Leunig et al, 2000; Eijer et al, 2001; Ito et al, 2001; Kloen et al, 2002; Siebenrock et al, 2004). A pincer lesion is the result of acetabular retroversion, coxa profunda, protrusio acetabuli, coxa vara or may develop after reconstructive osteotomy or trauma (Reynolds et al, 1999; Giori and Trousdale, 2003; Siebenrock et al, 2003; Beck et al, 2004).

History and physical examination

The typical patient with femoroacetabular impingement is an active and athletic adult. Cam impingement is found most commonly in young males whereas pincer impingement is generally seen in middle-aged females (Lavigne et al, 2004). Symptoms are usually activity-related and insidious in nature, being intermittent at the beginning and becoming more frequent. They may exacerbate after sitting for long periods. Pain is commonly localized to the groin and may be associated with mechanical symptoms such as locking, catching and giving way.

Clinical examination reveals some restriction of movements, although not always marked. The impingement sign (Klaue et al, 1991), which is defined as groin pain in flexion, adduction and internal rotation, is always positive. In cases of posteroinferior impingement the flexion, abduction and external rotation (FABER) test is positive. This is shown by an increased distance between the lateral aspect of the knee and the examination couch during the test, when compared with the normal, contralateral side.

Imaging

In cam impingement anteroposterior radiographs usually reveal a flattened head-neck junction of the upper femur, named a 'pistol grip' deformity or, in pincer impingement, overcoverage of the femoral head by the acetabulum (Figures 1 and 2) (Harris, 1986). Other radiographic findings may be a decreased head-neck offset, acetabular retroversion (Reynolds et al, 1999), coxa profunda, protrusio acetabuli (Ruelle and Dubois,

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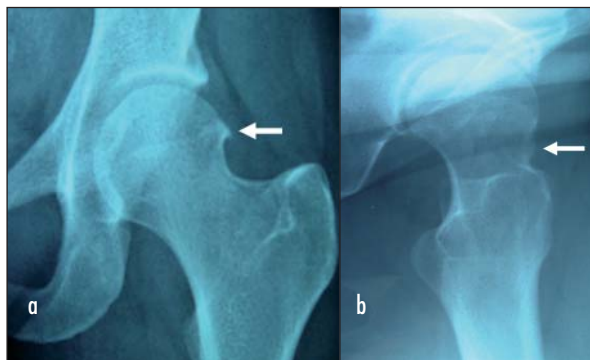


Figure 1. a. Anteroposterior and (b) lateral radiographs of the femoral head showing a cam lesion (arrows).

1962), a posterior wall sign (Reynolds et al, 1999), a cross-over sign (Reynolds et al, 1999) and an increased alpha-angle (Notzli et al, 2002). Magnetic resonance imaging is useful not only for the assessment of sphericity of the femoral head but also for the identification of the labral tears and chondral damage. However, magnetic resonance arthrography is now fast becoming the standard investigation for femoroacetabular impingement (Crawford and Villar, 2005).

Advantages of arthroscopic treatment

Open surgical treatment, as pioneered by Ganz et al (2003), involves trochanteric osteotomy and open hip dislocation (Espinosa et al, 2006; Peters and Erickson, 2006). This results in increased morbidity and a prolonged rehabilitation period in comparison with an arthroscopic procedure. Arthroscopic excision of femoroacetabular impingement is a day-case procedure and may result in a quicker return of high-demand athletes to competitive play (Crawford and Villar, 2005).

Figure 2. Pincer lesion: the overcoverage of the femoral head (arrow) is the cause of the impingement.



Studies have also shown the results to be comparable with open surgery (Sussmann et al, 2007). Nevertheless, further studies are clearly needed to investigate this in more detail.

Setup

Arthroscopy of the hip is a highly specialized procedure and acquisition of dexterity is a slow process (Khanduja and Villar, 2006). The dense soft tissue that surrounds the joint requires special instrumentation (Figure 3). Consequently, the instruments have extra length, canulae are available in a slotted format to allow the use of curved instruments, burrs and shaver blades are modified, and probes can be deflected up to 100° facilitating access to previously inaccessible areas of the hip joint. A 70° arthroscope is commonly used, although some surgeons use a 30° instrument for the peripheral compartment (Guanche and Bare, 2006).

The procedure is carried out under general anaesthesia and an image intensifier is used for guided insertion of the instruments. Traction of the limb is required for almost the half of the procedure, but it should not exceed a period of 2 hours (Philippon et al, 2007b). Two positions are used, the supine (Byrd, 1994, 2003) and lateral (Glick et al, 1987). A fracture table can be used for the supine position, whereas the lateral position, used in the authors' practice, requires a special distraction device (Figure 4).

Technique

Before passing instruments into the joint, the ability to distract the hip should be confirmed with the image intensifier. Traction is applied until a 'vacuum sign' (Griffin and Villar, 1999) is seen. The traction is then released, and preparation and draping are performed. When all instrumentation is ready, traction is reapplied, and once access to the joint is confirmed fluoroscopically, normal saline is injected into the hip joint under image intensifier control in order to further distract the joint. Anterolateral portals are commonly

Figure 3. General view of the arthroscopic instruments for the hip.

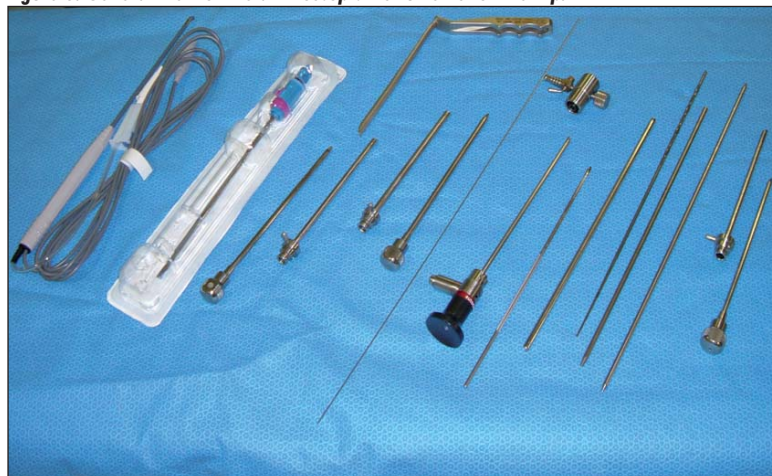




Figure 4. Position of the patient for a left hip arthroscopy using the lateral position.

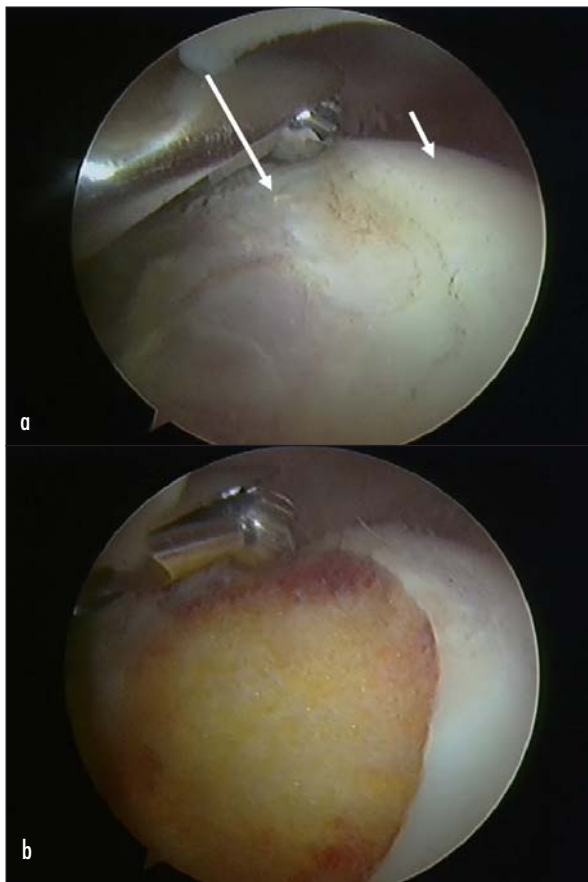


Figure 5. a. Arthroscopic view of the head–neck junction: the prominence of the cam lesion (long arrow) and the femoral head (short arrow). **b.** View of the head–neck junction after the resection: the ‘bump’ has been trimmed.

used. The authors normally use three portals, in the shape of an equilateral triangle, for the complete arthroscopic procedure.

A complete arthroscopic examination of the hip joint requires inspection of both the central compartment, which includes the weight-bearing area of the femoral head, acetabular articular cartilage, cotyloid fossa and ligamentum teres, and the peripheral compartment,

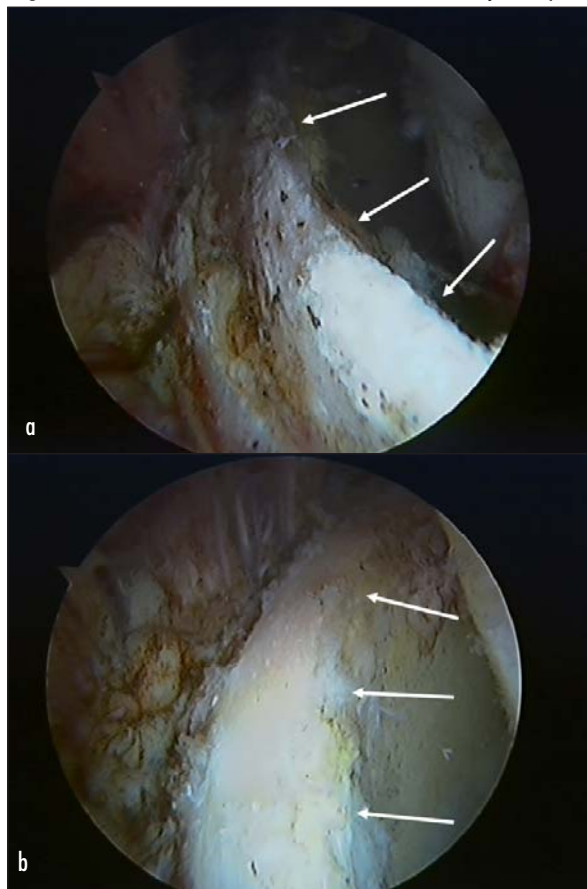
which contains the non-weight-bearing area of the femoral head, the femoral neck, part of the hip capsule and zona orbicularis. Although excision of a cam impingement lesion takes place in the peripheral compartment, visualization of the central compartment is needed in order to assess the acetabular and femoral head cartilage, as well as the labrum and ligamentum teres. Occasionally, there is a need for repair of a labral tear, or for microfracture, chondroplasty or drilling, in the case of cartilage damage. Traction is needed only for the central compartment. Consequently, upon completion of that part, traction is then released.

An impingement lesion may be either cam, pincer, or mixed (Khanduja and Villar, 2006). The cam lesion requires excision at the head–neck junction of the femur with burr and radiofrequency probes (Figures 5a and b). Pincer impingement (Figures 6a and b) requires acetabular recession, after detachment of the labrum, and subsequent re-attachment (Khanduja and Villar, 2006).

Complications

The complications of hip arthroscopy are usually caused by the distraction of the joint and the portal creation (Khanduja and Villar, 2006). In two prospective studies with 640 and 1054 patients, the rate of complications was 1.6% and 1.4% respectively (Griffin and Villar,

Figure 6. a. Pincer lesion: the acetabular rim, with a sharp, ossified edge. **b.** Treatment: the acetabular rim has been excised (arrows).



1999; Clarke et al, 2003), most complications being minor and only one major – septic arthritis, neurapraxia, haemorrhage, bursitis, haematoma, instrument breakage, chondral and labral damage, and fluid extravasation were among them. Pressure necrosis around the area of the perineal post can be prevented with adequate padding and lateralization of the distraction device. Septic arthritis is a very rare complication.

Avascular necrosis and femoral neck fracture are considered to be theoretical complications in excision of the impingement lesion, although some have been reported in the literature (Sampson, 2005). The risk of fracture is low if less than 30% of the diameter of the impingement lesion is removed (Mardones et al, 2005). The area of resection should be limited to 5–7 mm in depth and 8–12 mm in width (Philippon et al, 2007b). The surgeon should also be aware of the retinacular vessels, which are the major blood suppliers of the femoral head and which run along the lateral femoral neck (Gautier et al, 2000).

In the authors' practice, it is normal to warn patients that there is a 5% possibility of symptoms being made worse, and a small possibility that it may be impossible to enter the joint.

Postoperative course and rehabilitation

The authors always inform patients that a long rehabilitation period is likely to follow, which is normally between 3 and 4 months. Because of the risk of neck of femur fracture patients remain touch weight-bearing for 6 weeks. In cases of labral repair patients are asked to avoid flexion of the hip to more than 90°. An outpatient examination is arranged for 6 weeks after surgery.

Results

Arthroscopic treatment of femoroacetabular impingement has shown good results to date comparable with open procedures. In a study of 19 patients with a cam lesion, 16 showed improvement of their symptoms by the 2-year follow up and three had deteriorated (Ilizaliturri et al, 2008). In another study of 96 patients (100 hips), 75% showed good or excellent results at the 1-year follow up (Larson and Giveans, 2008), whereas Beck et al (2004), using open surgery, reported a 95% improvement at 1 year. Philippon et al (2007a) reported 93% of professional athletes returned to professional competition after a mean period of 1.6 years following arthroscopic femoroacetabular impingement surgery.

Conclusions

Although hip arthroscopy now offers a major, attractive advance in the surgical management of femoroacetabular impingement, further studies are needed to confirm its long-term beneficial effects. The preliminary clinical results show arthroscopic removal of a femoroacetabular impingement lesion to be a valuable minimally invasive technique, which improves pain and allows patients to

return to previous activities, with a low complication rate. Careful patient selection and sound clinical expertise are the prerequisite elements for success. **BJHM**

Conflict of interest: none.

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KEY POINTS

- Femoroacetabular impingement is found mainly in active adults.
- Arthroscopic management is a minimally invasive and attractive treatment.
- Results are equal to open treatment and the complication rate is low.
- A long rehabilitation period is required postoperatively.

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