

Background

What is hip impingement?

Hip impingement (referred to as femoroacetabular impingement, FAI) is a relatively recently recognized pathological process that is characterized as a disorder of the hip caused by abnormal contact between the femur and acetabulum. Unlike a normal hip, in FAI there is recurring contact between the anterior femoral head-neck region and the anterior aspect of the acetabular rim or labrum (the soft tissue bumper of the socket) during hip flexion, such as when running or sitting for prolonged periods ¹, due to deformities of the femoral head-neck region or the acetabular socket, or both. The repetitive rubbing between the femur and acetabulum is known to cause damage to the anterior aspect of the acetabular labrum and to the underlying articular cartilage. ² Damage to these structures of the hip results in significant hip pain and disability, particularly during or after hip flexion and internal rotation, and is strongly implicated as a cause of secondary osteoarthritis. ^{1,3} Hence, it is critical to restore the biomechanics of the FAI joint in order to prevent the development of end-stage osteoarthritis. ⁴

Who does FAI affect?

FAI is typically observed in young and middle-aged active adults who often present with groin pain and little or no history of previous trauma. ⁵ It is unclear at this time how many individuals are affected by FAI. Some of the common activities associated with FAI are ice hockey, soccer, yoga, golf, tennis, cycling, horseback riding, and car riding.

Why does it occur?

There is no specific answer for the aetiology of FAI. There is a general view in the literature that this condition may be a result of both heredity and environmental factors. One theory is that adults with FAI may have incurred a mild slip of the epiphysis during adolescent growth (i.e., prior to skeletal maturity) while engaging in significant athletic activity, which could leave the individual with a subtle developmental deformity of the hip and a predisposition to develop FAI. ⁶ Another theory is that frequent movement, particularly deep flexion, abduction and internal rotation, could result in the femoral head-neck region contact with the acetabular rim, which could result in the formation of an osteophyte at the head-neck region and, ultimately, FAI. ⁶ Other suspected causes include slipped capital femoral epiphysis, Legg-Calve-Perthes disease, and malunited femoral neck fractures. ³

What are the types of FAI?

There are two distinct types of FAI: Cam and pincer (figure 1). Cam impingement (figures 1), which is the most common form of FAI and is more frequent in young athletic men, is due to a nonspherical portion of the femoral head abutting against the acetabular rim (figure 2), particularly during flexion and internal rotation. ^{5,6} Pincer impingement, which is more common in middle-aged athletic women, results from over-coverage by the anterior part of the acetabulum to cause impingement of the normal (spherical) femoral head in flexion. ⁷ In most cases, cam and pincer forms exist together (mixed type). Beck et al. ⁸ noted that in 302 FAI cases, only 26 had an isolated cam and 16 an isolated pincer impingement.

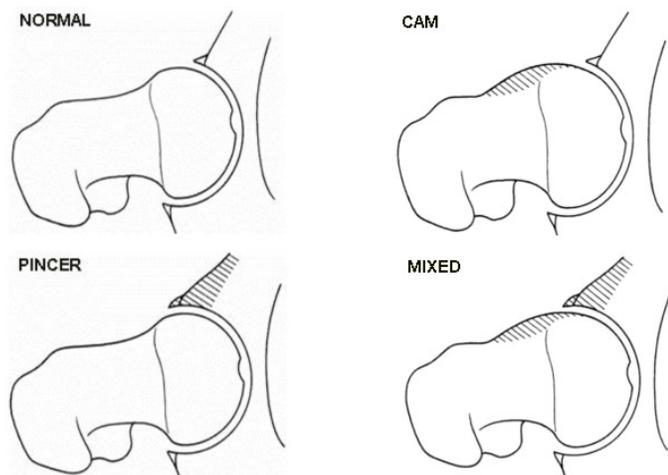


Figure 1. Illustration of a normal hip and conditions with FAI. Adapted from Lavigne et al. 2004.

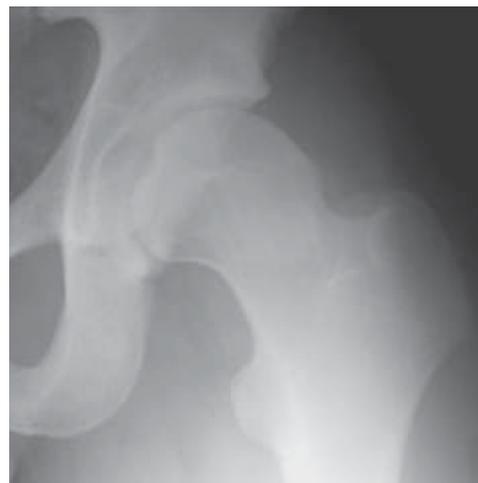


Figure 2. Radiograph of 21-year old wrestler with FAI. Note the non-spherical femoral head. Adapted from Clohisy et al. 2005.

What are treatment options for FAI?

An initial trial of non-surgical management of FAI is recommended by some authors.⁹ This generally involves activity modification, restriction on athletic pursuits, and a reduction of excessive motion and demand on the hip.⁹ Furthermore, a trial of NSAIDs may be prescribed to relieve pain, although this could mask the symptoms of an underlying destructive process. Physiotherapy, with emphasis on stretching, is considered to be counterproductive. Conservative treatments for FAI usually offer only temporary relief of symptoms.⁵

Surgical joint-preserving treatments to correct FAI are directed at restoring the normal range of motion of the hip and alleviate the femoral rubbing against the acetabular rim and to treat the associated labral and articular cartilage damage.⁷ These treatments can be divided into either open surgery or arthroscopic procedures.

Open surgery for FAI

Open surgery with surgical dislocation is a well recognized technique for the treatment of hip impingement.¹ This surgery involves an incision of 7 to 10 inches in length and a lateral or a posterior approach can be used. A trochanteric osteotomy (trochanteric flip) is often performed to improve exposure and dislocation of the hip allows a 360° view of the head and neck and a good view into the acetabulum.¹⁰ If the cause of FAI is a non-spherical femoral head or a prominent anterior femoral neck then a resection osteoplasty can be performed (figure 3).

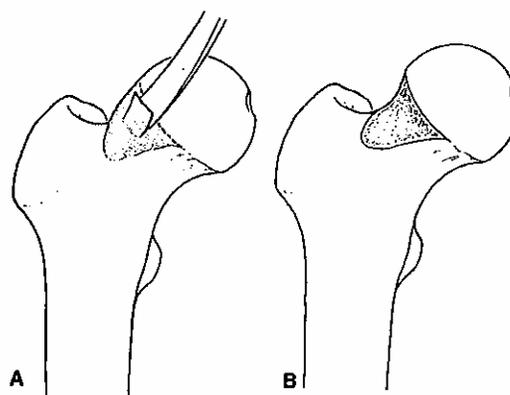


Figure 3. Resection osteoplasty of a femoral head-neck region before (A) and after (B), to recreate the normal spherical shape of the femoral head. Adapted from Lavigne et al. 2004.

Labral tears and damaged articular cartilage can also be treated with partial resection or repair. Acetabular rim osteophytes can also be removed.¹⁰ Pincer type FAI, due to acetabular over-coverage, can be treated by resection of the excessive anterior acetabular rim or by performing periacetabular osteotomy to reorient the acetabulum.⁵

Results of open surgery procedures from case series reports

Currently, there are very limited but encouraging reports on outcomes following open surgical procedures for the treatment of FAI. These reports are limited case series accounts and can only be viewed as preliminary clinical findings with this procedure.

Beck et al. (2004) retrospectively examined the outcomes of 19 FAI patients (14 males, 5 female) who had a mean age 36 years (range 21-52) and had open surgery with surgical dislocation between 1996 and 1997. The average follow-up period of this case series report was 4.7 years (range, 4.0-5.2). These authors noted that 14 patients (74%) had good results, with no incidence of osteonecrosis, and they concluded that open surgical treatment for FAI yields good results in patients that have early degenerative changes, but is not suitable for patients with advanced hip degeneration and extensive cartilage damage. Murphy et al. (2004) examined the outcomes of 23 patients (mean age 35.4 ± 9.5 years) who underwent open surgical debridement to relieve FAI and reported that at follow-up (mean 5.2 ± 2.9 years) 7 were converted to total hip arthroplasty, 1 received arthroscopic debridement for a recurrent labral tear, and 15 patients required no further surgery. These authors concluded that open surgical treatment for FAI is most effective in hips without considerable secondary arthrosis or instability. Siebenrock et al. (2003) used the open approach for 29 hips with FAI due to acetabular retroversion. At an average follow-up of 30 months (range, 24-49) it was noted that significant overall improvements in the range of internal rotation, flexion and adduction were achieved. Significant improvement was also achieved on activity measures and the results were considered good or excellent in 26 of the 29 hips. More recently, Peters et al. (2006) assessed the clinical and radiographic outcomes of 30 hips that underwent open surgery treatment for FAI. At a mean follow-up period of 32 months, there was an overall improvement in Harris hip scores, with no incidence of osteonecrosis and minimal complications. Four of the 30 hips were scheduled to be converted to total hip arthroplasty. The authors of this study stress that importance of good quality imaging technology to identify the severity of articular damage in FAI in order to guide clinical decision making.

Arthroscopic surgery for FAI

Recent advancements have seen the use of arthroscopic techniques to treat FAI. In this type of surgery, the hip is distracted and an arthroscope is used to assess the hip joint and treat damage that is found through two to four very small incisions. The patient is placed in a lateral decubitus position with a standard leg distractor and a c-arm fluoroscope is used to provide anterior to posterior radiographic viewing of the hip (figure 4).¹⁰



Figure 4. Arthroscopic procedure for FAI. Adapted from Diulus CA et al. 2006.¹¹

Often, all of the components associated with FAI, such as labral tears, damaged articular cartilage, and osteophytes on the femoral head-neck region and acetabulum, can be treated with the arthroscopic technique. Initially, the central compartment is examined and treated. This includes the surfaces of the femoral head, acetabulum, and the labrum. Repair of torn labrum may be performed, as well as stimulating new cartilage growth in areas of exposed subchondral bone via microfracture techniques.⁵ After the completion of arthroscopy in the central compartment, the traction is released and the peripheral compartment, which includes the femoral head-neck region, can be accessed. This allows for a possible arthroscopic resection osteoplasty to be performed. Finally, the external portion of the labrum can be visualized and acetabular rim osteophytes can be resected.¹⁰

Results of arthroscopic surgery for FAI from case series reports

Similar to the open procedure approach, there are very limited reports on the clinical outcomes with the minimally-invasive approach to treat FAI.

Sampson (2006)¹⁰ has published clinical outcomes results of arthroscopic surgery for FAI. In 183 hips, 94% achieved a high degree of satisfaction with the surgical outcome. Six patients had subsequent total hip arthroplasties. Consistent with the findings of case series reports with the open procedures, Sampson noted that poorer results with arthroscopy correlated with the amount of damage to the articular surfaces.

Furthermore, postoperatively patients did not require crutches after 2 to 4 weeks. For the majority of patients, pain decreased 50% in 2 to 6 weeks, 75% by 5 months, and 95% by 1 year after surgery.¹⁰ Two patients had pathologic fractures which required further surgery, and no other complications were reported. This author concluded that the early results are favourable and may be comparable to the open technique.

In another case series report, Guanche and Bare (2006)¹² assessed the outcomes of 10 consecutive patients treated for FAI. The patients had an average age of 34 years, and the mean follow-up period was 16 months (range, 9-24). Postoperatively, patients were restricted to limited weight bearing for 4 weeks, followed by full weight bearing. Resumption of high-impact athletic activities was permitted after 3 months. Eight patients who had no sign of intra-articular degeneration during arthroscopy had significantly better results than the two patients with degenerative disease. The mean non-arthritis score on the McCarthy scale increased from 75 to 95 points at 14 months follow-up.

Open versus arthroscopic surgery for FAI

Advocates of the open surgical procedure^{1,9} with surgical dislocation have argued that this approach provides an unobstructed 360° view of both the femoral head and acetabulum. The limited case series reports with this procedure show encouraging results. On the other hand, others⁶ believe that the open incision surgery results in significant soft tissue trauma which hinders postoperative recovery and that minimally-invasive arthroscopic techniques could provide faster recovery. Lavigne et al. (2004) have stated that the “constrained hip renders [arthroscopic] access to the underlying cause of impingement technically challenging, if not impossible.” Philippon and Schenker (2006) countered by stating that the combined use of long and flexible arthroscopic instrumentation, and accurate positioning of the lower extremity allows for 360° access to the femoral head-neck junction with arthroscopy. Comparative studies that assess the clinical outcomes of patients that receive open and arthroscopic surgery for FAI is required to compare the merits of both approaches.

Aim of review

The aim of this evidence review is to evaluate the evidence in the literature towards the clinical efficacy and safety of the open surgical approach compared to minimally-invasive arthroscopic techniques for the treatment of FAI.

Search Strategy

The objective of this evidence review was to assess outcomes of patients who receive open surgical approach with dislocation versus those who receive arthroscopic surgery for the treatment of FAI. To ensure that studies of good scientific quality were selected, preference was given for Cochrane systematic reviews and randomized controlled trials. However, all types of comparative studies could be included in this review. Non-comparative studies, such as case series, case studies, and expert opinions, are regarded as having the lowest level of evidence¹³ and were excluded in this review.

Searches of the major medical electronic databases (Cochrane Database of Systematic Reviews, PubMed, and EMBASE) were conducted with the following search strategy:

(hip OR femoroacetabular OR femoro-acetabular) AND (impingement OR abutment OR jamming) AND (management OR treatment OR technique OR options OR concepts OR approach OR procedure) AND English[la]

Study inclusion criteria:

The selection criteria for published studies were as follows:

- Comparative studies that assess outcomes (efficacy, safety, cost-effectiveness) of open incision surgery with dislocation versus arthroscopic surgery for the treatment of FAI.
- Studies with patient data
- Studies limited to English-language reporting

Study exclusion criteria:

- Non-comparative studies (e.g., case series, case report)
- Studies that do not contain patient data

Search Results

No published studies of any type were identified in the literature that met this review’s inclusion criteria.

Cochrane systematic reviews:

- None

Randomized controlled trials:

- None

Cohort or case-controlled studies:

- None

Studies excluded but of interest

- Kim KC et al. 2006. Influence of Femoroacetabular Impingement on Results of Hip Arthroscopy in Patients with Early Osteoarthritis. *Clin Orthop Relat Res.* [Epub ahead of print] (Case series reports with patients who had advanced degenerative disease).

Results

No comparative studies were identified in the literature on clinical outcomes of the open surgical approach with surgical dislocation of the hip versus minimally-invasive arthroscopic surgery for the treatment of FAI. Numerous centres are performing both techniques, and published studies should accumulate in due course.

Conclusion

There is a lack of good evidence to determine whether open surgical techniques with dislocation of the hip are superior to or less beneficial than arthroscopic techniques for the treatment of FAI.

Limitations

A publication bias is present as only studies published in English were selected.

Potential conflict of interest

None known

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