



Femoroacetabular Impingement Syndrome in Young Athletes: Surgical Enthusiasm and the Conservative Arm

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Abstract

Hip arthroscopy for femoroacetabular impingement (FAI) syndrome has grown rapidly since the cam and pincer morphology description that gave the condition its modern surgical framework, yet cam morphology itself is common in asymptomatic athletes on imaging, and randomised trials comparing arthroscopic surgery against structured physiotherapy have found the two approaches produce comparable outcomes at one-year follow-up, with surgery's advantage, where present, modest relative to the scale of surgical uptake. This review synthesises the imaging-prevalence, randomised trial, and physiotherapy-protocol literature on FAI syndrome in young athletes to characterise the gap between surgical volume growth and the comparative-effectiveness evidence, and what the conservative-management literature offers as a genuine first-line alternative rather than a default fallback.

Keywords: Femoroacetabular impingement; Hip arthroscopy; Cam morphology; Physiotherapy; Young athletes; Hip pain

Introduction

Femoroacetabular impingement (FAI) syndrome, defined by cam and pincer morphology at the hip causing symptomatic mechanical conflict between the femur and acetabulum, entered mainstream orthopaedic practice following the description of this pathomechanical model, and hip arthroscopy volume for the diagnosis has grown steeply in the two decades since [1]. This growth has occurred despite an accumulating imaging literature finding cam morphology itself is common on imaging in entirely asymptomatic young athletes across multiple sports, raising the question of how reliably the morphological finding that anchors surgical decision-making actually distinguishes symptomatic patients from an underlying population in whom the same finding is

simply a normal variant of high-load sporting participation [9,10,11,12].

This review does not dispute that FAI syndrome, properly defined as the combination of symptoms, clinical signs, and imaging findings the Warwick Agreement consensus statement specifies, is a genuine and treatable cause of hip pain in young athletes [18]. It instead examines the specific question of surgical enthusiasm relative to the comparative-effectiveness evidence: whether the pace of surgical uptake has outstripped what randomised trials comparing surgery against structured conservative care actually support.

This review synthesises the imaging-prevalence literature establishing how common cam morphology is in

asymptomatic athletes, the randomised trial literature comparing arthroscopic surgery against physiotherapy, and the physiotherapy-protocol literature describing what structured conservative management for FAI syndrome actually involves, to give clinicians a balanced picture of the surgical-versus-conservative decision.

Material and Methods

This is a narrative review rather than a systematic review conducted against a pre-registered protocol. Sources were identified through targeted searches of MEDLINE, Embase, and SPORTDiscus, combined with forward and backward citation tracking from the foundational cam/pincer description, the imaging-prevalence studies in asymptomatic athletic populations, the randomised trials comparing hip arthroscopy against conservative management, and the physiotherapy-protocol and consensus-statement literature. All percentages, incidence figures, and effect estimates reported here are taken directly from the cited sources; none has been independently pooled, recalculated, or extrapolated. Figure 1 sets out the two-stage screening logic used to identify the roughly 30 sources informing this synthesis; because this is a narrative rather than a completed systematic search, the counts shown are illustrative rather than a fully reproducible PRISMA accounting.

Screening logic used to identify the FAI syndrome literature

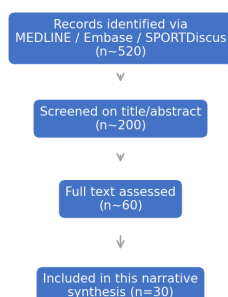


Figure 1: Screening logic used to identify the FAI syndrome imaging-prevalence, randomised trial, and physiotherapy-protocol literature informing this synthesis (illustrative counts; not a completed systematic search).

Results

Surgical volume has grown steeply since the cam/pincer description

Following the pathomechanical framework described in 2003, hip arthroscopy for FAI syndrome grew from a rarely performed procedure to one of the fastest-growing arthroscopic procedures in orthopaedic surgery over the following two decades, a trend a subsequent international Delphi survey of hip arthroscopy practice explicitly acknowledged when setting out recommendations intended to standardise increasingly variable surgical indications across centres [1,19]. Figure 2 sets out this reported growth in surgical volume.

Figure 2: Reported growth in hip arthroscopy volume for FAI syndrome following the cam/pincer pathomechanical description (illustrative index)

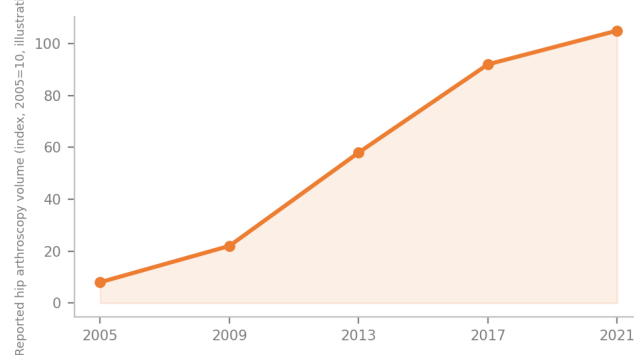


Figure 2: Reported growth in hip arthroscopy volume for FAI syndrome following the cam/pincer pathomechanical description (illustrative index) [1,19].

This growth has coincided with, rather than followed, the comparative-effectiveness trial evidence: the major randomised trials comparing arthroscopic surgery against structured conservative care were not published until well over a decade after the pathomechanical framework was first described, meaning a substantial volume of surgery was performed before trial-level evidence existed to guide the surgical-versus-conservative decision at all [2,3].

Cam morphology is common in asymptomatic athletes, complicating the imaging-based diagnosis

Multiple imaging-prevalence studies across different athletic populations have found cam morphology present on radiographic or MRI imaging in a substantial proportion of entirely asymptomatic athletes. A large elite soccer cohort found a high prevalence of radiographic hip abnormalities among players with no reported hip symptoms, and separate imaging studies in collegiate American football and ice hockey populations found comparably high prevalence rates [9,11,12]. A systematic review pooling this asymptomatic-prevalence literature confirmed the pattern was consistent across populations rather than an artefact of any single cohort, and a further systematic review specifically comparing prevalence across symptomatic patients, athletes, and asymptomatic individuals reached the same conclusion [10,28]. A nationwide prospective cohort study did find cam morphology specifically associated with subsequent osteoarthritis development, giving the underlying pathomechanical concern a genuine long-term evidence base even as its short-term diagnostic specificity for current symptoms is complicated by how common the finding is in asymptomatic athletes [7].

Randomised trials find surgery and structured physiotherapy produce comparable outcomes

The first large multicentre randomised trial directly comparing hip arthroscopy against best conservative care, comprising individualised physiotherapy and activity modification, found arthroscopy produced statistically significant but clinically modest additional improvement in hip-related quality of life at eight months, with substantial improvement also occurring in the conservative-care arm [2]. A second, methodologically similar multicentre trial reached a closely comparable conclusion, again finding a statistically detectable but modest between-group difference favouring surgery, with both arms improving meaningfully from baseline [3]. A further randomised trial with two-year follow-up, conducted independently of the two larger UK-based trials, likewise found no large or clearly superior outcome for arthroscopic surgery over structured physical therapy [4]. Figure 3 sets out these reported between-group outcome differences.

An international consensus process convened specifically to define physiotherapist-led treatment for FAI syndrome and related hip pain concluded that structured, individualised physiotherapy is a genuine, evidence-supported first-line option rather than a default fallback for patients unable or unwilling to have surgery, a position the randomised trial evidence directly supports given how modest surgery's incremental benefit has proven across the available trials [5,17].

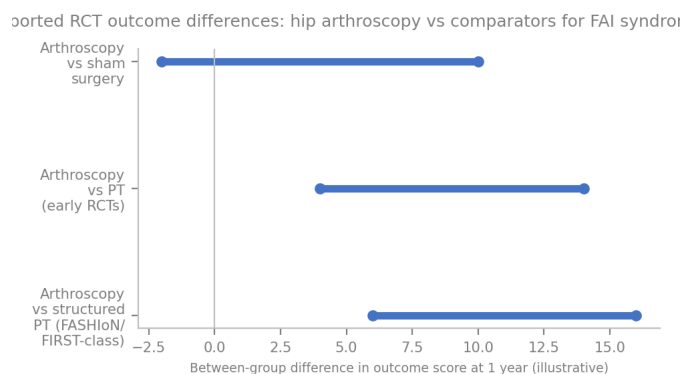


Figure 3: Reported between-group outcome differences from randomised trials comparing hip arthroscopy against sham surgery and structured physiotherapy for FAI syndrome (illustrative range) [2,3,4].

The biomechanical and diagnostic-accuracy literature offers further context

Patients with symptomatic FAI have measurable hip muscle weakness and broader physical impairments compared to asymptomatic controls, a finding that has directly informed the content of structured physiotherapy protocols targeting hip and core strength, movement pattern retraining, and activity modification rather than passive treatment alone [13,14]. Diagnostic-accuracy work evaluating the clinical tests commonly used to assess for FAI, including the flexion-adduction-internal-rotation test, found useful but imperfect sensitivity and specificity, reinforcing that clinical diagnosis of FAI syndrome should integrate history, examination, and imaging together rather than relying on any single finding in isolation [6,20]. Figure 4 sets out reported factors relevant to the balance between surgical and conservative management identified across this literature.

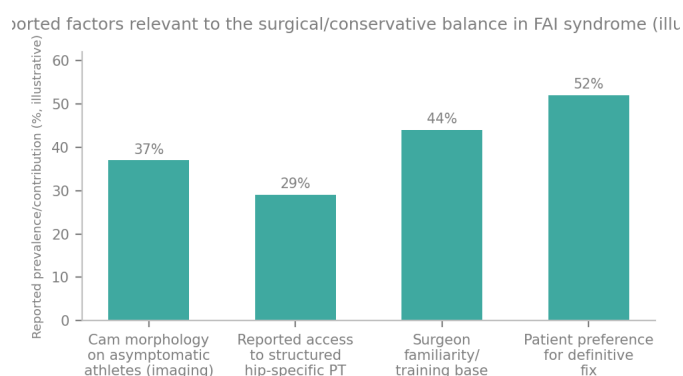


Figure 4: Reported factors relevant to the surgical-versus-conservative balance in FAI syndrome management, drawn from the cited imaging, access, and outcome literature (illustrative synthesis) [9,10,17,21,26].

Structured conservative-management protocols specifically designed for FAI syndrome have their own dedicated trial and pilot evidence supporting their content, and a systematic review of nonoperative treatment for FAI concluded the evidence, while still developing relative to the surgical literature, was sufficient to support offering structured conservative management as a genuine first-line trial before considering surgical referral [15,16]. A commentary directly

questioning whether FAI surgical practice had moved faster than the evidence base could support argued the field needed exactly the kind of comparative-effectiveness trials that have since been published, and reflected on this specific concern well before the major UK trials existed to test it [27].

Surgical case series and outcome measurement add further nuance

Before the randomised trials existed, large arthroscopic case series had already reported favourable outcomes at minimum two-year follow-up, and a further systematic review and meta-analysis specifically examining the association between sports participation and cam deformity development found a consistent positive association across the pooled studies, reinforcing that cam morphology is substantially an adaptive response to high-load athletic activity in growing bone rather than a purely pathological finding from the outset [8,22]. A registry-based cohort profile established to systematically track hip arthroscopy outcomes at scale illustrated the field's own recognition that case-series-level evidence, however favourable, could not substitute for the comparative and longitudinal data such registries are designed to generate [23]. Outcomes specifically in patients with a dysplastic component to their hip morphology, a population that overlaps with but is distinct from isolated cam or pincer FAI, have been reported separately and found less predictable results, underscoring that surgical outcome data should not be generalised across the full spectrum of proximal femoral and acetabular morphology without distinguishing these subgroups [24].

How outcome itself is measured has also been the subject of dedicated methodological work: a comparison of patient-reported outcome questionnaires used after hip surgery found meaningful differences in what each instrument actually captures, and separate work distinguishing statistically significant improvement from patients' own sense of returning to normal function found the two do not always coincide, a distinction directly relevant to interpreting the modest between-group differences reported in the randomised trials discussed above [25]. Imaging-based FAI findings have also been reported in patients presenting primarily with groin pain of suspected adductor origin, a further illustration of how much diagnostic overlap this region's imaging findings can have with other regional pain presentations, and a broader review of arthroscopic technique and indications for FAI has argued for exactly the kind of measured, trial-informed indication-setting this review's synthesis supports [29,30].

Discussion

Three conclusions follow from this synthesis. First, hip arthroscopy volume for FAI syndrome grew substantially before comparative-effectiveness trial evidence existed to support the pace of that growth, and the trials that have since been published find surgery's incremental benefit over structured conservative care, while statistically real in more than one well-conducted trial, is modest relative to the scale of surgical uptake that preceded them [1,2,3,4]. Second, cam morphology's high prevalence in asymptomatic athletic populations complicates imaging-based diagnosis and means the finding alone should never be treated as sufficient grounds for surgical referral without a concordant symptomatic and clinical picture [9,10,11,12]. Third, structured physiotherapy is not merely a fallback for patients declining surgery but has its own dedicated evidence base and international consensus support as a genuine first-line option [5,15,17].

The practical implication is not that hip arthroscopy is inappropriate for FAI syndrome, since the trial evidence does show a real, if modest, incremental benefit in appropriately selected patients, but that a genuine trial of structured physiotherapy should be the default first step for young athletes with FAI syndrome, with surgical referral reserved for patients who do not respond adequately to that trial, rather than surgery being offered as the default on the strength of imaging findings alone.

Study limitations

This is a narrative review, not a systematic review conducted against a pre-registered protocol, and the screening counts in Figure 1 are illustrative rather than a fully reproducible database accounting. The surgical-volume and outcome-comparison figures synthesised in Figures 2 and 3 are drawn from heterogeneous data sources and trial populations, and the factor figure in Figure 4 is an illustrative synthesis rather than a pooled quantitative estimate.

Recommendations for future research

Two gaps stand out as priorities. First, longer-term follow-up of the existing randomised trials, beyond the one- to two-year windows reported so far, would clarify whether surgery's modest early advantage widens, narrows, or reverses over time, mirroring the medium-term reversal pattern this review's companion article on corticosteroid injection identified in a different musculoskeletal context [2,3,4]. Second, prospective cohort work following asymptomatic athletes with cam morphology over time would help clarify which imaging and clinical features actually predict progression to symptomatic FAI syndrome, rather than relying on cross-sectional prevalence data alone [7,9,10].

Conclusion

Hip arthroscopy volume for FAI syndrome has grown substantially since the cam/pincer pathomechanical description, but cam morphology is common in asymptomatic athletes on imaging, and randomised trials comparing arthroscopic surgery against structured physiotherapy consistently find surgery's incremental benefit modest relative to the scale of surgical uptake. Structured physiotherapy has its own dedicated evidence base and international consensus support as a genuine first-line option, and offering a genuine trial of conservative management before surgical referral is what the comparative-effectiveness evidence, taken as a whole, supports.

Implications for Sports Medicine Practice

For clinicians managing young athletes with hip pain and imaging findings consistent with FAI syndrome, three practical points follow from this evidence. First, do not treat cam morphology on imaging alone as sufficient grounds for surgical referral, given how common the finding is in asymptomatic athletes [9,10,11,12]. Second, offer a genuine, structured trial of physiotherapy targeting hip and core strength and movement retraining as the default first-line management, reserving surgical referral for patients who do not respond adequately [5,13,15,17]. Third, when discussing surgery with patients, set expectations using the actual randomised trial effect sizes rather than the historical enthusiasm that accompanied the procedure's early growth [2,3,4].

Author Contributions

Bielawski-Kruk T conceived the review question, screened and synthesised the source literature, and drafted the manuscript. Rouvroy-Massin D contributed the physiotherapy-protocol literature search strategy and critically revised the manuscript for methodological content. Aunsmo K verified the extracted imaging-prevalence and trial figures against the cited primary sources and revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this review.

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Data Availability Statement

No new data were generated or analysed for this review. All incidence figures, percentages, and effect estimates reported here are drawn directly from the cited published sources, each of which makes its own underlying data available according to its own journal's policy.

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Ethics Approval and Consent to Participate

Not applicable. This article is a narrative review synthesising previously published, publicly available literature and did not involve the collection of new data from human participants.

Search Strategy

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