

Safety and Efficacy of Femoroacetabular Impingement Syndrome Procedures: Assessing Signals for Update

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Previous Coverage Decision

Femoroacetabular impingement (FAI) syndrome was first reviewed by the HTA program in 2011.

- In 2014, a review of FAI medical literature was conducted to determine if newly available published evidence could change the original coverage determination. The technology was not selected for rereview.
- In 2018, a second update literature review was conducted. The technology was not selected for rereview.
- In 2019, the HCA director selected FAI for rereview based on newly available published evidence that could change the original coverage determination.
- A rereview of femoroacetabular impingement syndrome was completed in 2019. The Committee's Coverage Decision for the 2019 report is summarized below.

Health Technology Background

Femoroacetabular impingement (FAI) results from abnormal morphology of the acetabulum and femoral head/neck resulting in abnormal contact between the proximal femur and acetabulum during the end range of hip motion, particularly flexion and internal rotation. There are two types of FAI: cam impingement (non-spherical femoral head or abnormality at the head-neck junction) and pincer impingement (deep or retroverted acetabulum resulting in over coverage of the femoral head). Proponents for operative intervention believe that surgical correction of the impinging deformities will alleviate the symptoms and retard the progression of OA degeneration.

Hip surgery is an invasive procedure to correct FAI using either an open surgery or arthroscopic approach. The surgeon resects abnormal outgrowths of bone, removes damaged cartilage, and reshapes the femoral neck to ensure that there is sufficient clearance between the rim of the joint socket and the neck of the femur. Labral debridement and labral repair are surgical treatment options for treating damaged labral tissue when addressing FAI. After corrective surgery, avoidance of weight bearing for several weeks to months and rehabilitation is required. Surgery to correct FAI includes arthroscopy, open dislocation of the hip, and arthroscopy combined with a mini-open approach.

Health Technology Clinical Committee's Findings and Coverage Decision

Topic: Hip Surgery for Femoroacetabular Impingement Syndrome (FAI)

Meeting Date: November 22, 2019

Final Adoption: January 17, 2020

HTCC Coverage Determination

Hip Surgery for Femoroacetabular Impingement Syndrome (FAI) is **not** a covered benefit.

Committee Findings

The committee reviewed and discussed the available studies for use of hip surgery for FAI. The discussion focused on studies available since the original review in 2011. Details of study design, inclusion criteria, outcomes and other factors affecting study quality were discussed. A clinical expert member provided detailed insight and discussion points. A majority of committee members found the evidence sufficient to determine that use of hip surgery for FAI was less safe or unproven for safety and less cost-effective or unproven for cost-effectiveness. The committee prospective on the efficacy of hip surgery for FAI was evenly divided between unproven and more effective in some cases.

The committee checked for availability of a Centers for Medicare and Medicaid Services (CMS) national coverage decision (NCD). There is no Medicare national or local coverage determination for surgical treatment of FAI.

No new evidence-based clinical guidelines were identified for this review. The original review included a guideline from the National Institutes for Health and Clinical Excellence (NICE) for arthroscopic and open hip surgery. This guideline had not been updated since the original review (2011). The committee discussed two identified expert consensus documents (not formal guidelines) for FAI from the following organizations:

- The Warwick Agreement
- Lynch systematic review, 2019

There are no current or new guidelines for the HTCC to compare for consistency with their determination.

Committee Decision

Based on the deliberations of key health outcomes, the committee decided that it had the most complete information: a comprehensive and current evidence report, public comments and state agency utilization information. The committee decided that the current evidence on hip surgery for femoroacetabular impingement syndrome (FAI) is sufficient to make a determination on this topic. The committee discussed and voted on the evidence for the use of FAI. The committee considered the evidence and gave greatest weight to the evidence it determined, based on objective factors, to be the most valid and reliable. Based on these findings, the committee voted to not cover hip surgery for FAI.

1. Purpose of Report

A prior update report was completed in October 2019. The purpose of this update is to determine whether or not there is sufficient evidence published subsequent to the last signal assessment to trigger a re-review of this technology. The key questions from the 2019 report are listed below.

Key question 1

What is the evidence of efficacy and effectiveness of hip surgery (open or arthroscopic) compared with no surgery for FAI?

Key question 2

What is the evidence of the safety of hip surgery for FAI compared with no surgery?

Key question 3

What is the evidence that hip surgery for FAI compared with no surgery has differential efficacy or safety issues in sub populations?

Key question 4

What evidence of cost implications and cost-effectiveness of hip surgery compared with no surgery exists for FAI?

2. Methods

2.1 Literature Searches

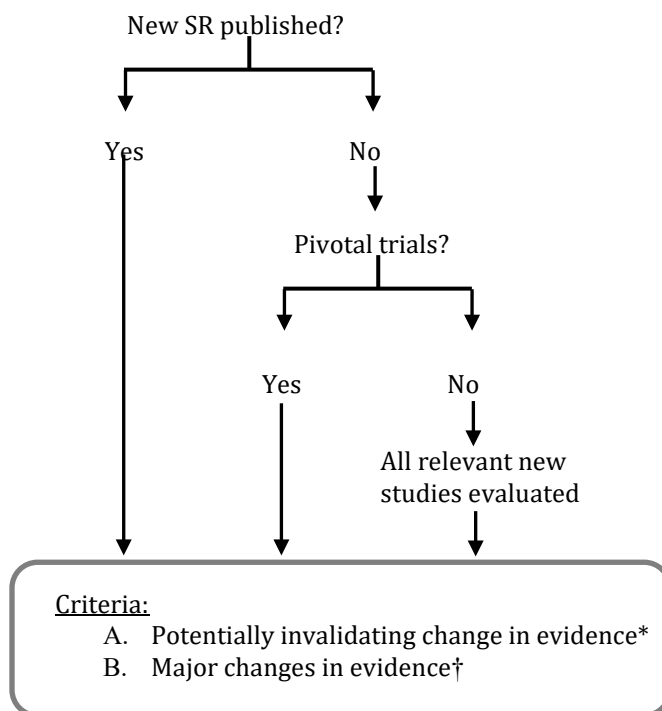
We conducted an electronic literature search for the period January 1, 2018 through October 11, 2023 using identical search terms used for the last report for key questions 1 through 4. This search included three main databases: PubMed/Medline, Cochrane Library, and EMBASE. Appendix A reports the search methodology for this topic.

2.2 Study selection

We used the same inclusion and exclusion criteria as the 2019 HTA.

2.3 Compilation of Findings and Conclusions

For this assessment we constructed a summary table that included the key questions 1-4, the 2019 conclusions, new sources of evidence, new findings, and new conclusions based on available signals. To assess whether the conclusions might need updating, we used an algorithm based on a modification of the Ottawa method, Figure 1.

Figure 1. Algorithm of the modified Ottawa Method of Identifying Signals for SR Update

*A-1. Opposing findings: Pivotal trial or SR including at least one new trial that characterized the treatment in terms opposite to those used earlier

A-2. Substantial harm: Pivotal trial or SR whose results called into question the use of the treatment based on evidence of harm or that did not proscribe use entirely but did potentially affect clinical decision making

A-3. Superior new treatment: Pivotal trial or SR whose results identified another treatment as significantly superior to the one evaluated in the original review, based on efficacy or harm.

†B-1. Important changes in effectiveness short of "opposing findings"

B-2. Clinically important expansion of treatment

B-3. Clinically important caveat

B-4. Opposing findings from discordant meta-analysis or nonpivotal trial

3. Results

3.1 Search

From 195 citations returned from the updated search, 179 were excluded at title/abstract review. Of the 16 reviewed at full text, 12 systematic reviews and metaanalyses¹⁻¹¹ and 2 RCTs^{12,13} that addressed in part or in full key questions 1 through 4, were retained (Figure 2). The results of all the systematic reviews were summarized (Appendix B). Two newer metaanalyses^{7,11} included the two new randomized trials. However, one of these systematic reviews included duplicate data for a primary outcome in the pooled analysis.¹¹ Therefore, one systematic review addressing the efficacy of treatment with the most up-to-date RCTs informed the assessment for KQ1.⁷ One meta-analysis addressed KQ2,⁷ and one addressed KQ4.¹⁴ No new studies were found addressing KQ3. A full list of excluded studies and the reasons for exclusions can be found in Appendix C.

3.2 Identifying signals for re-review

Table 1 shows the original key questions, the conclusions of the original report, the new sources of evidence, the new findings, and the recommendations of Aggregate Analytics, Inc. (AAI) regarding the need for update. Appendix B summarizes the results for the included systematic reviews.

Figure 2. Flow chart showing results of literature search

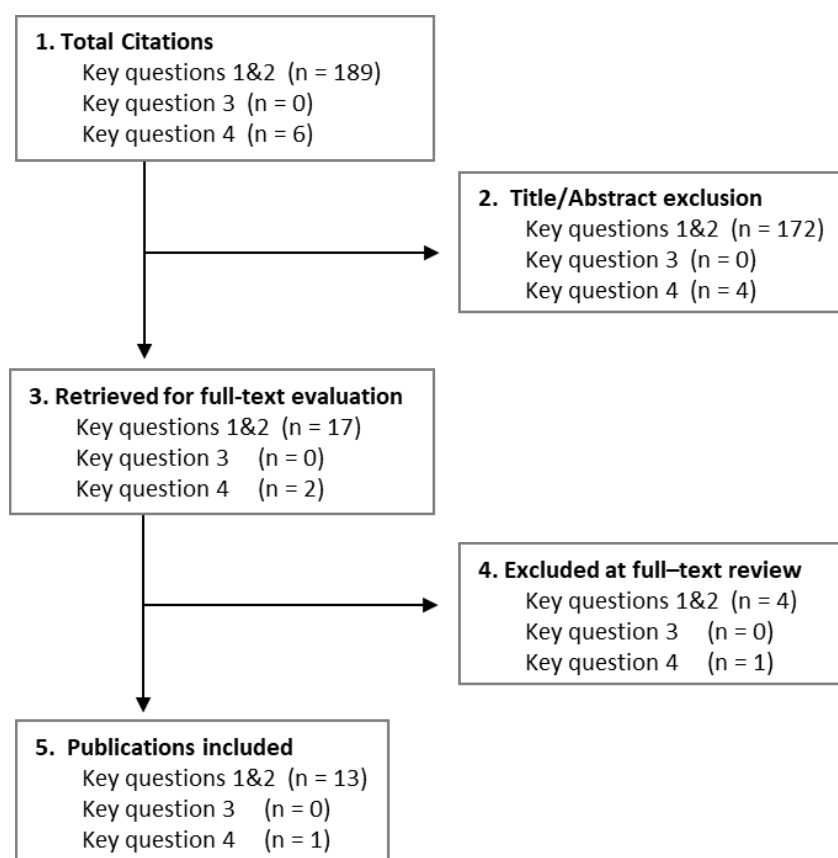


Table 1. Summary Table of Key Questions 1-4

Conclusions from CER Executive Summary	New Sources of Evidence	New Findings	Conclusion from AAI
Key Question 1: What is the evidence of efficacy and effectiveness of hip surgery (open or arthroscopic) compared with non-operative treatment for FAI/FAIS? Including consideration of short-term (≤ 5 years) intermediate-term (>5 years to <10 years) and long-term (≥ 10 years) outcomes?			
<ul style="list-style-type: none"> Improvement favoring arthroscopy versus physical therapy was seen for function based on the iHOT-33 in 3 RCTs and the HOS-Sport subscale in 2 RCTs at 6 to 8 months. However, only the difference on the HOS-Sport subscale is likely clinically significant. (SOE: low) No clear difference between groups was seen for functional outcomes at any other timepoint measured: i-HOT-33 at 12 months (2 trials) and 24 months (1 trial), and no difference the HOS-ADL and HOS-Sport subscales at 12 and 24 months in one RCT. (SOE: low for the i-HOT-33 at 12 months; insufficient for the i-HOT-33 at 24 months and the HOS-ADL and -Sport subscales at both timepoints). One RCT reported that more arthroscopy patients compared with physical therapy patients achieved clinically important improvements in function according to the HOS-ADL subscale in the short term (8 months). Greater improvement in pain based on the Copenhagen hip and groin outcome score (HAGOS) was reported by patients who received arthroscopy versus PT at 8 months in one RCT. Though the difference may be clinically important, the confidence interval is wide. This same trial found that fewer arthroscopy patients reported pain on hip motion, but there were no differences between groups on other assessments; clinical relevance of differences is unclear (SOE: low). Across two RCTs, two patients (1.0%) in the arthroscopy groups compared with no patient who received PT required conversion THA over 12 and 24 months; sample size and follow-up likely impacted the ability to adequately capture this event (SOE: insufficient). 	Systematic Review: <ul style="list-style-type: none"> One SR (Lamo-Espinosa)⁷ containing two new RCTs (Hunter, Martin)^{12,13} 	Efficacy <ul style="list-style-type: none"> One new SR reported improvement favoring arthroscopy versus physical therapy based on the iHOT-33 (4 RCTs, pooled MD 10.65 on a 0-100 scale, 95% CI 6.54 to 14.76), and the HOS-ADL (3 RCTs, pooled MD 8.09 on a 0-100 scale, 95% CI 3.11 to 13.07) at one-year follow-up. The difference for the iHOT-33 exceeds the MCID of 6.1 and is likely clinically important. The difference in the HOS-ADL approached the MCID and may be clinically important. There are no new data with respect to conversion to total hip arthroplasty or longer-term outcome. 	<p>This section of the report contains new data in the form of 2 RCTs. Pooled results suggest that hip surgery for FAI may be more efficacious with respect to functional outcomes than physical therapy in the short-term (B-1 criteria for trigger)</p> <p>There continues to be no evidence for intermediate- or long-term outcomes.</p>

Conclusions from CER Executive Summary	New Sources of Evidence	New Findings	Conclusion from AAI
Key Question 2: What is the evidence of the safety of hip surgery for FAI/FAIS compared with non-operative treatment?			
<u>Safety</u> <ul style="list-style-type: none"> The risk of reoperation (other than conversion to THA) occurred in 4% (arthroscopy and open dislocation) and 9% of the patients (mini-open). There was only one reported head-neck fracture (0.1%) and no reports of AVN, osteonecrosis or trochanteric nonunion. Heterotopic ossification occurred in 2% to 3% of those receiving arthroscopy or mini-open, and 6% in those receiving open dislocation. Neurological complications (nerve palsy, paresthesia, and neuropraxia) were rare in those receiving arthroscopy or open dislocation; however, they occurred in 22% of 258 hips undergoing a mini-open procedure. Most were transient in nature. 	Systematic Review: Lamo-Espinosa ⁷	<u>Safety</u> <ul style="list-style-type: none"> One systematic review (Lamo-Espinosa) found a higher pooled risk of osteoarthritis in patients receiving hip arthroscopy compared with physical therapy in the short term (2 trials, 17.5% [7/490] vs. 2.6% [1/39], odds ratio 6.8, 95% CI 0.9 to 52.9). Following surgery for FAI, the pooled risks for the following outcomes in the short term were: additional surgery in 2 trials, 10% (9/89); infection in 3 trials, 1.7% (5/299); numbness (transient) in 2 trials, 26.7% (50/187); nerve injury in 1 trial, 1.8% (2/112). There are no intermediate or long-term safety data available. 	This section of the report remains valid and does not need updating.
Conclusions from CER Executive Summary	New Sources of Evidence	New Findings	Conclusion from AAI
Key Question 3. What is the evidence that hip surgery for FAI/FAIS compared with non-operative treatment has differential efficacy or safety issues in subpopulations?			
<u>Differential efficacy, effectiveness or safety</u> <ul style="list-style-type: none"> We found no studies comparing the differential efficacy, effectiveness or safety of surgery versus nonsurgical care in FAI patients. Outcomes following FAI surgery were consistently worse in patients with greater preoperative osteoarthritis compared with those with less osteoarthritis. There was no reported difference in outcomes in patients with varying degrees of chondral damage assessed during surgery. 	Systematic Review: No new sources of evidence	<ul style="list-style-type: none"> We found no new studies comparing the differential efficacy, effectiveness or safety of surgery versus nonsurgical care in FAI patients. 	This section of the report remains valid and does not need updating.

• No data from other subpopulations were found.			
Conclusions from CER Executive Summary	New Sources of Evidence	New Findings	Conclusion from AAI
Key Question 4. What is the cost-effectiveness of hip surgery for FAI/FAIS compared with non-operative treatments in the short and long term?			
<u>Cost-effectiveness</u> There were no cost-effectiveness, cost utility or costing studies found on FAI surgery.	Systematic Review: Go ¹⁴	In the majority of the studies, hip arthroscopy had a higher initial cost but provided greater gain in QALYs than did a nonoperative treatment. In certain cases, hip arthroscopy can be cost-effective given a long enough duration of benefit and appropriate patient selection. However, there is further need for literature to analyze willingness-to-pay thresholds.	This section of the report remains valid and does not need updating.

AAI = Aggregate Analytics, Inc.; AVN = avascular necrosis; CER = comparative effectiveness review; CI = confidence interval; FAI(S) = femoroacetabular impingement (syndrome); HAGOS = Copenhagen hip and groin outcome score; HOS-ADL = Hip Outcome Score Activities of Daily living subscale; HOS-Sport = Hip Outcome Score Sport subscale; iHot-33 = International Hip Outcome Tool; MCID = minimal clinically important difference; MD = mean difference; QALY = Quality-adjusted life years; RCT = randomized controlled trial; SOE = strength of evidence; SR = systematic review; THA = total hip arthroplasty.

Conclusions of the 2023 Signals for Update Assessment - FAI

Efficacy

- There are several new systematic reviews on FAI since the publication of the HTA in 2019. The majority do not include new studies. However, the latest SR published in 2023 included two new RCTs in their pooled analysis. Their results suggest that functional outcomes after one-year are better in those receiving hip surgery for FAI compared with physical therapy. These differences may be clinically meaningful. (Criteria B-1)

Safety

- One systematic review found a marked increase in the risk of osteoarthritis in patients receiving hip arthroscopy compared with physical therapy in 2 trials (OR 6.8, 95% CI 0.9 to 52.9).
- The risk of reoperation in those receiving arthroscopy was 10%.

Differential Efficacy and Safety

- We identified no new studies comparing the differential efficacy, effectiveness or safety of surgery versus nonsurgical care in FAI patients.

Cost Effectiveness

- One systematic review concluded that hip arthroscopy had a higher initial cost but provided greater gain in QALYs than did a nonoperative treatment. In certain cases, hip arthroscopy can be cost-effective given a long enough duration of benefit and appropriate patient selection. However, there is further need for literature to analyze willingness-to-pay thresholds.

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<https://trialsjournal.biomedcentral.com/counter/pdf/10.1186/s13063-021-05151-6.pdf>.

APPENDIX A. SEARCH STRATEGIES

Below is the search strategy for PubMed. Parallel strategies were used to search other electronic databases listed below. Keyword searches were conducted in the other listed resources. In addition, hand-searching of included studies was performed.

Appendix Table B1: PubMed Search strategy for Key Questions 1, 2, and 3

	Search Strategy (LIMITS)	Search Dates	No. of hits
1.	FEMOROACETABULAR IMPINGEMENT* OR FEMOROACETABULAR IMPINGEMENT* OR "Femoroacetabular Impingement"[Mesh] OR ((HIP OR ACETABUL* OR FEMUR OR FEMORAL) AND IMPINGEMENT*) OR "femoral osteochondroplasty" OR "femoral osteoplasty"	01/01/2018 to 10/11/2023	
2.	"Reoperation"[Mesh] OR "Femur Head Necrosis"[Mesh] OR "Arthroplasty, Replacement, Hip"[Mesh] OR REOPERATION REATTACHMENT OR AVN OR AVASCULAR NECROSIS OR TOTAL HIP OR TOTAL JOINT OR ARTHROPLASTY OR INFECTION* OR DEATH OR COMPLICATION* OR ADVERSE EVENT OR "Intraoperative Complications"[Mesh] OR SCIATIC* OR NERVE OR NEURO* OR FRACTURE* OR INTRAABDOM* OR CARDIAC ARREST OR THROMBO* OR EMBOL* OR INSTABILITY	01/01/2018 to 10/11/2023	
3.	#1 AND #2 AND (SYSTEMATIC REVIEW OR RANDOMIZED CONTROLLED TRIAL) LIMIT ENGLISH	01/01/2018 to 10/11/2023	189

Appendix Table B2: PubMed Search strategy for Key Question 4

	Search Strategy (LIMITS)	Search Dates	No. of hits
1.	FEMOROACETABULAR IMPINGEMENT* OR FEMOROACETABULAR IMPINGEMENT* OR "Femoroacetabular Impingement"[Mesh] OR ((HIP OR ACETABUL* OR FEMUR OR FEMORAL) AND IMPINGEMENT*) OR "femoral osteochondroplasty" OR "femoral osteoplasty"	01/01/2018 to 10/11/2023	
2.	COST OR "Cost-Benefit Analysis"[Mesh]	01/01/2018 to 10/11/2023	
3.	#1 AND #2 (LIMIT ENGLISH)	01/01/2018 to 10/11/2023	6

Electronic Database Searches

The following databases have been searched for relevant information:

Cochrane Database of Systematic Reviews
 Cochrane Registry of Clinical Trials (CENTRAL)
 PubMed
 ClinicalTrials.gov
 AHRQ - Healthcare Cost and Utilization Project
 Canadian Agency for Drugs and Technologies in Health
 Google

APPENDIX B. SUMMARY OF INCLUDED STUDIES**Appendix Table B1. Summary of Included Systematic Reviews Comparing Hip Surgery Versus No Surgery for Femoroacetabular Impingement**

Assessment	Evidence- base Used	Outcomes	Results Effect Estimate (95% CI)	Authors' Conclusions
Systematic Review Used to Assess Trigger				
Lamo-Espinosa et al. ¹ 2022	5 RCTs (Griffin 2018, Mansell 2018, Palmer 2019, Hunter 2021, Martin)	iHot-33 (12 month f/u) HOS-ADL (6-8 month f/u) HOS-ADL (12 month f/u) Complications surgery vs no surgery	IHOT-33: MD 10.65 (6.54, 14.76) HOS ADL: MD 5.19 (0.77, 9.61) HOS-ADL: MD 8.09 (3.11, 13.07) Infection: 5/299 (1.7%) vs. 0/306 Add Surgery: 9/89 (10%) vs. 0/89 Numbness: 50/187 (26.7%) vs. 0/196 Nerve Injury: 2/112 (1.8%) vs. 0/110 Osteoarthritis: 7/40 (17.5%) vs. 1/39 (2.6%), OR 6.8 (0.9 to 52.9)	Arthroscopic surgery showed statistical superiority over the control group without exceeding the MCID in most studies; however, the results might have been influenced by secondary variables. Finally, arthroscopic surgery results in a high rate of conversion to osteoarthritis.
Other Systematic Reviews Published After the Last Report				
Zhu et al. ² 2022	5 RCTs (Griffin 2018, Mansell 2018, Palmer 2019, Hunter 2021, Martin)	iHot-33 (12 month f/u) HOS-ADL (6-8 month f/u) EQ-5D 5L (12 month f/u) EQ-5D 3L/5L (12 month f/u)	IHOT-33: MD 9.43 (6.11, 12.76) HOS-ADL: MD 6.98 (2.13, 11.83) EQ-5D 5L: MD 2.52 (-1.15, 6.19) EQ-5D 3L/5L: MD 0.06 (9.01, 0.11)	Hip arthroscopy is statistically superior to conservative treatment in both long-term and short-term effects.
Mahmoud et al. 2022	4 RCTs (Griffin 2018, Mansell 2018, Palmer 2019, Hunter 2021)	iHot-33 (12 month f/u) EQ-5D 5L (12 month f/u) EQ-5D 3L/5L (12 month f/u)	IHOT-33: SMD 9.84 (2.31, 17.38) EQ-5D 5L: SMD 36.55 (-4.57, 17.67) EQ-5D 3L/5L: SMD .06 (-90.3, 0.14)	Apart from SF-12 and Global Rating of Change, all other scores have shown significantly better outcomes with HA in comparison to TPP at 8- and 12-month follow-up points. Hip arthroplasty offers better patient-reported outcomes than targeted physiotherapy programs for

Assessment	Evidence- base Used	Outcomes	Results Effect Estimate (95% CI)	Authors' Conclusions
				management of FAIS at 8- and 12-months follow-up.
Mok et al. ³ 2021	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u) HOS-Sport (6-8 month f/u) HOS-ADL (6-8 month f/u)	iHOT-33: MD 2.11 (1.37, 2.85) HOS-Sport: MD 7.56 (-2.96, 18.08) HOS-ADL: MD 9.22 (5.93, 12.51)	Arthroscopic hip surgery provided essential benefit compared with conservative therapy in improving activity of daily living and quality of life.
Ferreira et al. 2021	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u) EQ-5D 5L (12 month f/u)	iHOT-33: MD 11.02 (4.893, 17.21) EQ-5D 5L: MD 3.69 (-0.02, 7.40)	Hip arthroscopic surgery for FAI provides superior outcomes compared to non-operative care at 12 months, but not at 24 months.
Casartelli et al. ³ 2021	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u)	iHOT-33: MD 10.9 (4.7, 17.0)	Both hip arthroscopy and physical therapy resulted in statistically and clinically significant short-term improvements in hip pain, function, and quality of life in patients with FAIS. Hip arthroscopy was statistically superior to physical therapy in improving the outcome at follow-up even if improvement may not be detected by patients.
Bastos et al. 2021	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u)	iHOT-33: MD 5.53 (-3.11, 14.16)	There is moderate-quality evidence that surgical treatment is not superior to conservative treatment for femoroacetabular impingement syndrome in the short term, and there is low-quality evidence that it is not superior in the medium term
Schwabe et al. 2020	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u) HOS-Sport (6-8 month f/u) HOS-ADL (12 month f/u)	iHOT-33: SMD 11.3 (1.9, 20.7) HOS-Sport: SMD 6.23 (-6.76, 19.22) HOS-ADL: SMD 3.88 (-9.55, 17.32)	Superior short-term outcomes for surgery versus PT. However, PT did result in improved outcomes and did not appear to compromise the surgical

Assessment	Evidence- base Used	Outcomes	Results Effect Estimate (95% CI)	Authors' Conclusions
				outcomes of patients for whom therapy failed and who progressed to surgery.
Kim et al. 2020	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u) HOS-Sport (6-8 month f/u) HOS-ADL (6-8 month f/u)	iHOT-33: MD 8.42 (3.22, 13.63) HOS-Sport: MD 2.65 (-16.82, 22.11) HOS-ADL: MD 5.15 (-3.72, 14.01)	Patients with FAI syndrome treated with hip arthroscopy have statistically superior hip-related outcomes in the short term compared with those treated with physical therapy alone.
Gatz et al. ³ 2020	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u) HOS-Sport (6-8 month f/u) HOS-ADL (6-8 month f/u) EQ-5D 5L (12 month f/u)	iHOT-33: MD 9.67 (4.52, 14.83) HOS-Sport: MD 11.94 (5.41, 18.46) HOS-ADL: MD 10.42 (5.45, 15.39) EQ-5D 5L: MD 3.75 (0.39, 7.12)	Arthroscopic hip surgery is an effective therapeutic treatment for FAI revealing superior results than a non-surgical approach with physiotherapy.
Dwyer et al. ³ 2020	3 RCTs (Griffin 2018, Mansell 2018, Palmer 2019)	iHot-33 (12 month f/u)	iHot-33: MD 3.46 (1.20, 6.86)	Patients with FAI syndrome treated with hip arthroscopy have statistically superior hip-related outcomes in the short term compared with those treated with physical therapy alone.

CI = confidence interval; EQ-5D-5L: EuroQol 5 Dimensions quality of life questionnaire; HAGOS = Copenhagen hip and groin outcome score; HOS-ADL = Hip Outcome Score Activities of Daily living subscale; HOS-Sport = Hip Outcome Score Sport subscale; iHot-33 = International Hip Outcome Tool; MCID = minimal clinically important difference; MD = mean difference; RCT = randomized controlled trial

¹Infection, nerve injury and osteoarthritis risks were included from an imbedded cohort not randomized.

²This systematic review included duplicate data from Realpe 2021¹⁵, a report based on the Griffin 2018 randomized trial.

³Some outcome measured were pooled from different follow-up times (6 months and 12 months).

APPENDIX C. EXCLUDED STUDIES AT FULL REVIEW

STUDY	REASON FOR EXCLUSION
KQs 1 and 2	
Griffin DR, Dickenson EJ, Achana F, et al. Arthroscopic hip surgery compared with personalised hip therapy in people over 16 years old with femoroacetabular impingement syndrome: UK FASHIoN RCT. <i>Health Technol Assess.</i> Feb 2022;26(16):1-236.	Duplicate data from Griffin 2018
Anzillotti G, Iacomella A, Grancagnolo M, et al. Conservative vs. Surgical Management for Femoro-Acetabular Impingement: A Systematic Review of Clinical Evidence. <i>J Clin Med.</i> Oct 2 2022;11(19)	Qualitative study, no pooled analysis
Ayeni OR, Karlsson J, Heels-Ansdell D, et al. Osteochondroplasty and Labral Repair for the Treatment of Young Adults With Femoroacetabular Impingement: A Randomized Controlled Trial. <i>Am J Sports Med.</i> Jan 2021;49(1):25-34.	No non-operative treatment arm (arthroscopy vs. lavage)
Realpe AX, Foster NE, Dickenson EJ, Jepson M, Griffin DR, Donovan JL. Patient experiences of receiving arthroscopic surgery or personalised hip therapy for femoroacetabular impingement in the context of the UK fashion study: a qualitative study. <i>Trials.</i> Mar 16 2021;22(1):211.	Observational cohort imbedded in an RCT
KQ 4	
Griffin DR, Dickenson EJ, Achana F, et al. Arthroscopic hip surgery compared with personalised hip therapy in people over 16 years old with femoroacetabular impingement syndrome: UK FASHIoN RCT. <i>Health Technol Assess.</i> Feb 2022;26(16):1-236.	Duplicate data from Griffin 2018