

Current Concepts: Young Adult Hip Disease Management

An Evidence Based Approach



Olufemi R Ayeni MD PhD FRCSC
Associate Professor McMaster University
Sports Medicine & Arthroscopy Fellowship Director
Medical Director: Hamilton Tiger-Cats Football Club &
Forge FC April 2019 Pain Rounds

ETA code ETABXZB



DISCLOSURES

- Speaker's Bureau
 - Conmed
- Editorial Board
 - Knee Surgery Sports Traumatology and Arthroscopy
 - American Journal of Sports Medicine
 - Canadian Orthopaedic Association Bulletin
 - BMC Musculoskeletal Disorders
- Research:
 - Arthroscopy Association of North America
 - Canadian Institute for Health Research
 - American Orthopaedic Society for Sports Medicine
 - McMaster University
 - Conmed

HEADLINES

Injured hip sidelines A-Rod

Yankees slugger Alex Rodriguez will have arthroscopic surgery Monday to repair a tear in his hip socket. This is the latest in a series of injuries that have sidelined the star player.

Career statistics

GAMES PLAYED

200

150

100

50

0

'94 '96 '98

BATTING AVERAGE

.400

.350

.300

.250

.200

'94 '96 '98

HOME RUNS

60

50

40

30

20

10

0

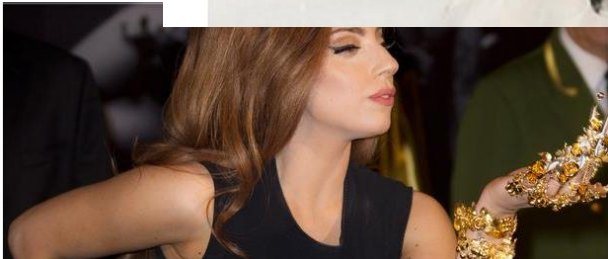
'94 '96 '98

SEATTLE

SOURCE: Major League Baseball

By LESLEY SAVAGE / CBS Sports

Lady Gaga details



A Crushing Hip Injury

The New York Times

HOME

VIDEO

NHL

CFL

NFL

MLB

NBA

...

FIGURE SKATING

SKIING

SPEED SKATING

NHL Home

Scores & Schedule

Standings

Stats

Teams

Players & Injuries

Transactions

Draft

Odds

Video

Photos

Broadcast

Predators goalie Pekka Rinne to have hip surgery

No. 1 netminder to miss at least 4 weeks of action

The Associated Press | Posted: Oct 24, 2013 12:31 PM ET | Last Updated: Oct 24, 2013 4:48 PM ET



ADVERTISEMENT

head and the hip bone.

Sources: Dr. Jordan Metz, Dr. Bryan Kelly

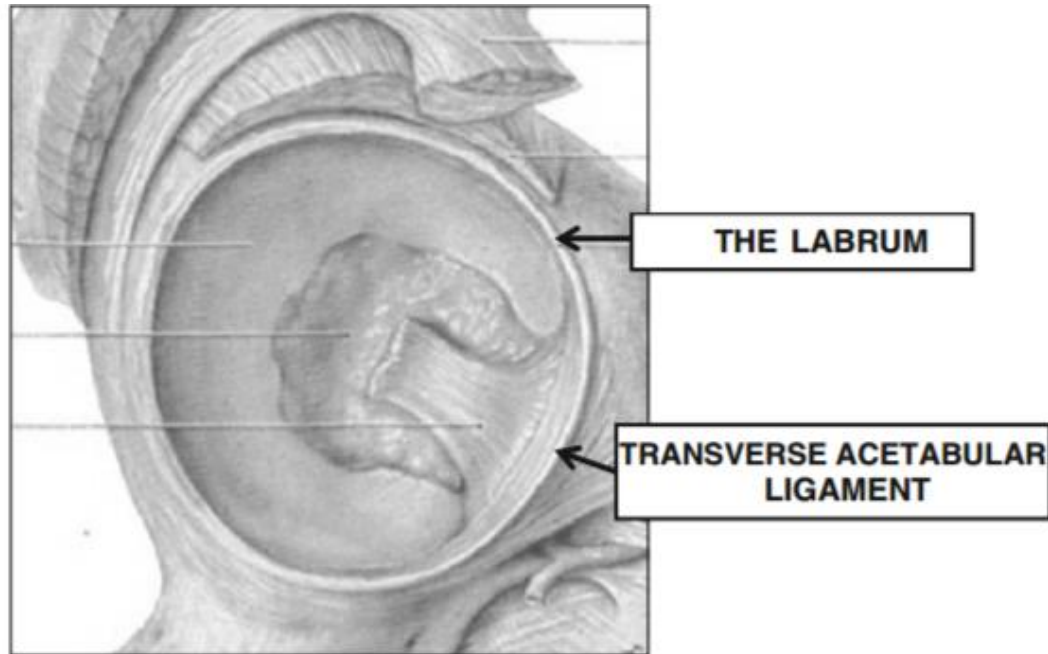
XAQUÍN G.V. / THE NEW YORK TIMES

WHY BOTHER WITH THIS TOPIC?

- Surgeons/Therapists aim to provide best available care to patients.
- Patients in 2019 are:
 - Sophisticated
 - Informed
 - Have rapid access to information about Condition, Surgeon & Procedure



FUNCTION OF LABRUM



Grant et al 2012, J Child Orthop

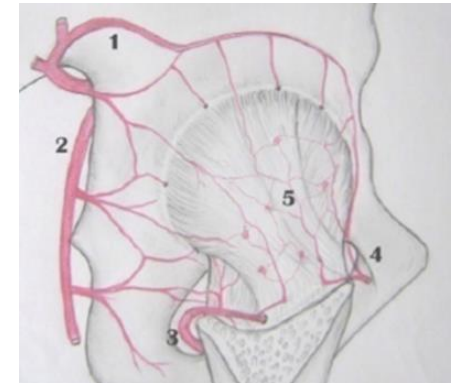
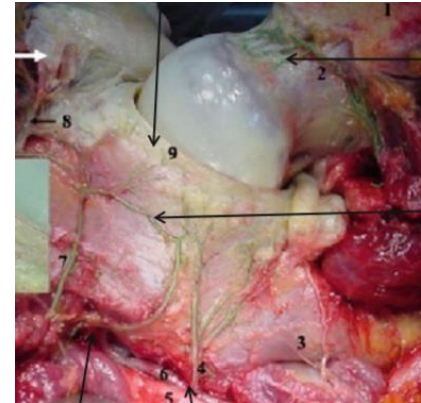
• Functions

- **Suction seal mechanism preventing cartilage consolidation, Ferguson et al 2000, J Biomech.**
- **Enhances joint nutrition. Ferguson et al 2001. J Orthop Res**
- **Contributes to joint stability and proprioception, Smith MV et al AJSM 2011**

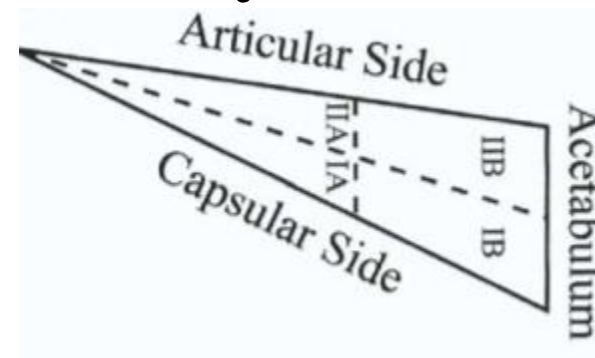
LABRUM STRUCTURE VASCULARITY/INNERVATION

- Supplied by Superior and Inferior Gluteal Arteries form a retinaculum for blood supply
- Innervated by branches of the quadratus femoris and obturator nerve
- Capsular blood supply is dominant

- **Kalhor et al. JBJS AM 2009**



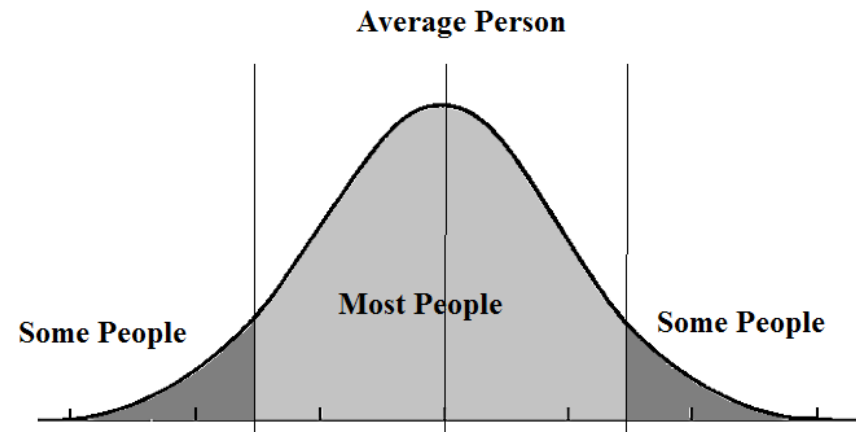
- **Kelly BT et al Arthros. 2005**



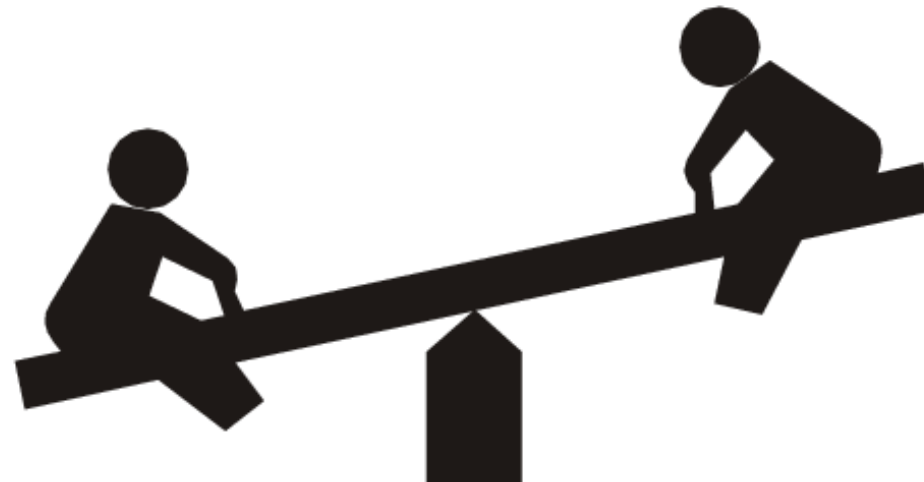
HOMEOSTASIS OF THE HIP LABRAL TEARS



DYSPLASIA

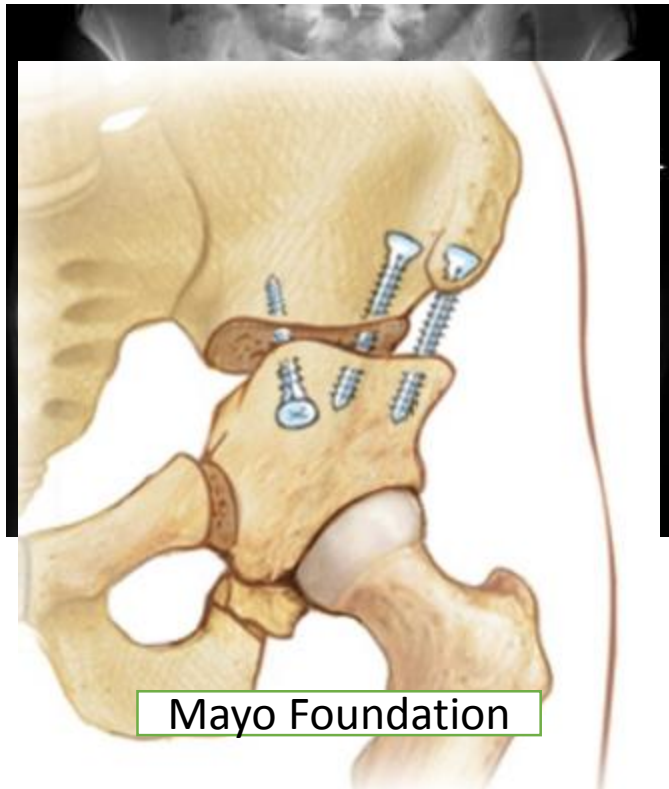


FAI



HIP DYSPLASIA & ARTHROSCOPIC MANAGEMENT

- Clinical Dilemma 24 Female



Mayo Foundation

BJR ■ **HIP**

Hip arthroscopy in the setting of hip dysplasia

A SYSTEMATIC REVIEW

**M. Yeung,
M. Kowalczyk,
N. Simunovic,
O. R. Ayeni**

Objective

Hip arthroscopy in the setting of hip dysplasia is controversial in the orthopaedic community, as the outcome literature has been variable and inconclusive. We hypothesise that outcomes of hip arthroscopy may be diminished in the setting of hip dysplasia, but outcomes

Radiographic criteria for

Borderline or mild dysplasia

- Centre edge angle of 20° to 24°
- Centre edge angle of 18° to 20°
- Centre edge angle of 22° to 24°
- Centre edge angle of 25° or greater

General or moderate hip dysplasia

- Centre edge angle < 20°
- Centre edge angle of 16° to 18°
- Centre edge angle of < 25°
- Centre edge angle of 16° to 24°
- Centre edge angle of 19° to 27°

- acetabular index of < 20° or anterior or posterior undercoverage of the femoral head of < 10%

No radiographic criteria provided

used (%)

18 STUDIES – 889 PATIENTS
MEAN F/U 32 MONTHS
12/18 STUDIES LEVEL IV
14.1 % REVISION
9.5 % ARTHROPLASTY

1 (5.6)
 1 (5.6)
 1 (5.6)
 4 (22.2)

FAI: IS IT A NEW ENTITY?

TREATMENT OF MALUM COXAE SENILIS, OLD SLIPPED UPPER FEMORAL EPIPHYSIS, INTRAPELVIC PROTRUSION OF THE ACETABULUM, AND COXA PLANA BY MEANS OF ACETABULOPLASTY *

BY M. N. SMITH-PETERSEN, M.D., BOSTON, MASSACHUSETTS
Chief of Orthopaedic Service, Massachusetts General Hospital; Clinical Professor of Orthopaedic Surgery, Harvard Medical School

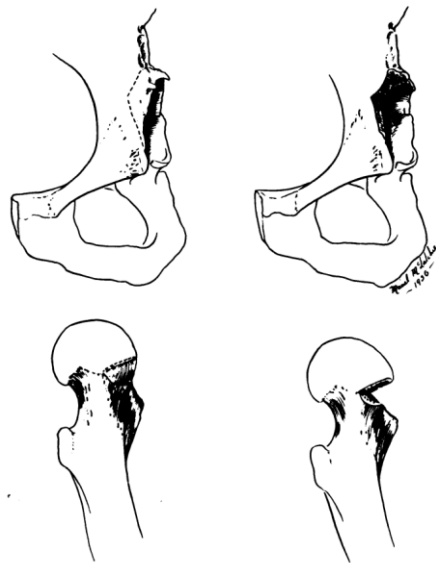


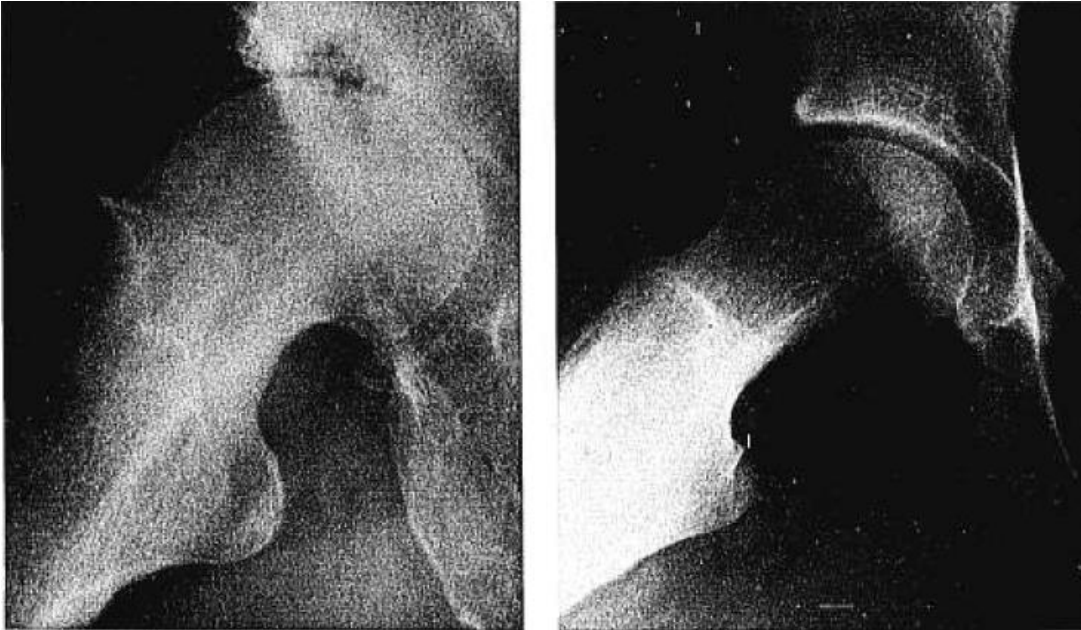
FIG. 1

Diagrams demonstrating the amount of bone which must be removed from the acetabulum or from the neck of the femur in order to produce the same improvement in the range of motion. This amount of bone may be easily spared from the acetabulum, but not from the neck of the femur.

What is the source of this patient's pain? “ The answer was (JBJS 1936):

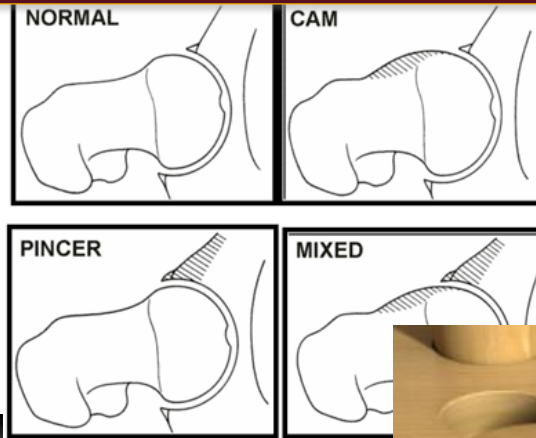
“ The impingement of the femoral neck on the anterior acetabular margin. Such impingement would result in “traumatic arthritis “ with characteristic changes of the joint surfaces as well as of the synovia.”

FAI: CAN IT CAUSE HIP DEGENERATION?

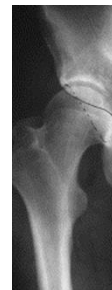
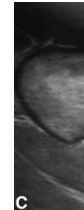


- Harris WH 1966, JBJS
- Observational Study
- **Over 90%** of “idiopathic osteoarthritis of the hip” showed demonstrable abnormalities.
- Many had mild forms of paediatric hip conditions such as DDH, SCFE, Perthes

FEMOROACETABULAR IMPINGEMENT



- **Femoroacetabular impingement: a cause for osteoarthritis of the hip.**
Ganz R, Parvizi J, Beck M, Leunig Siebenrock KA. CORR



conflict between
head/neck and acetabular
leads to early damage

WARWICK AGREEMENT *BJSM* 2016

- ***“FAI syndrome is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs and imaging findings. It represents symptomatic premature contact between the proximal femur and the acetabulum.”***



IS FAI RELEVANT TO SPORTS MEDICINE?

- Congenital/Genetic
- Acquired/Activity Related
- ...Both...



Knee Surg Sports Traumatol Arthrosc (2014) 22:920–925
DOI 10.1007/s00167-013-2598-5

HIP

Femoroacetabular impingement in elite ice hockey players

Olufemi R. Ayeni · Kamal Banga · Mohit Bhandari ·
Zeev Maizlin · Darren de SA · Dmitry Golev ·
Srinivasan Harish · Forough Farrokhyar

**Conclusion: Significant ($P < 0.03$)
Difference in Cam Type FAI in
Hockey Players (54 vs. 43 degrees)**



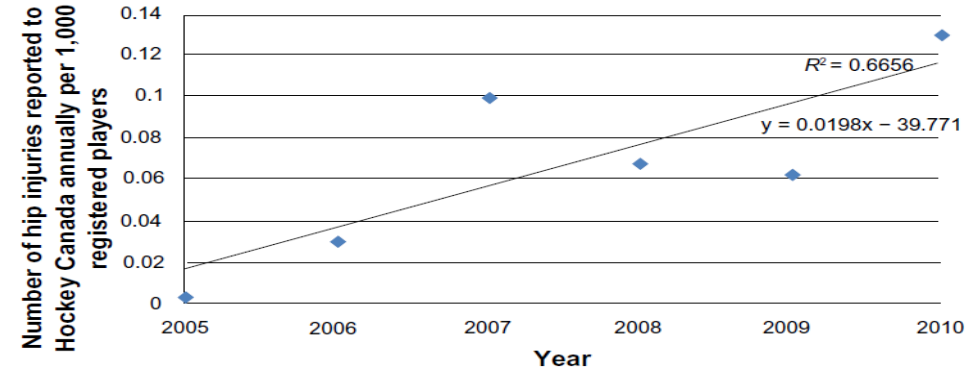
SPORTS HIP INJURIES IN YOUTH ICE HOCKEY

19 June 2014

Open Access Journal of Sports Medicine

Trends in reporting of mechanisms and incidence of hip injuries in males playing minor ice hockey in Canada: a cross-sectional study

Olufemi R Ayeni¹
 Marcin Kowalczyk¹
 Jordan Farag¹
 Forough Farrokhyar^{1,2}
 Raymond Chu¹
 Asheesh Bedi³
 Kevin Willits⁴
 Mohit Bhandari^{1,2}



Year	Hip injuries reported per 1,000 registered players (n)	95% CI
2005	0.003	(0.003–0.004)
2006	0.030	(0.029–0.031)
2007	0.100	(0.099–0.101)
2008	0.068	(0.063–0.065)
2009	0.063	(0.062–0.064)
2010	0.129	(0.128–0.131)

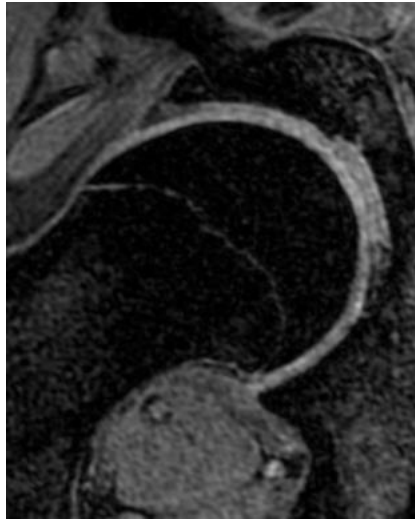
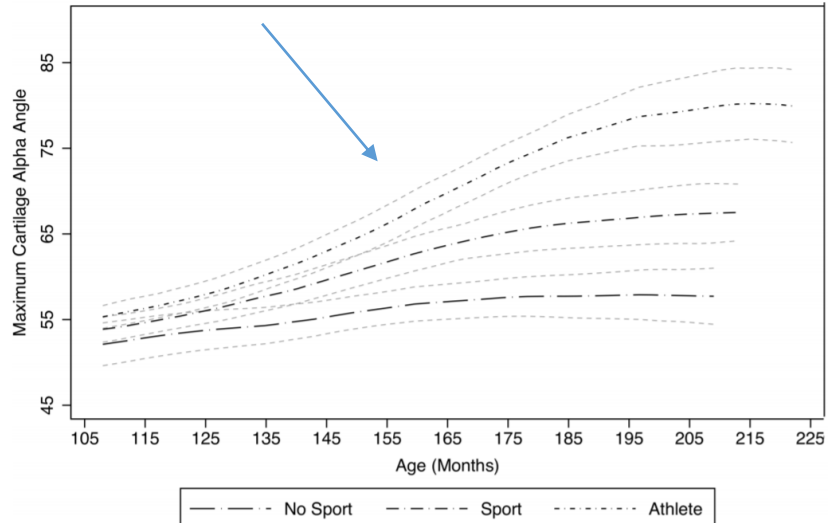
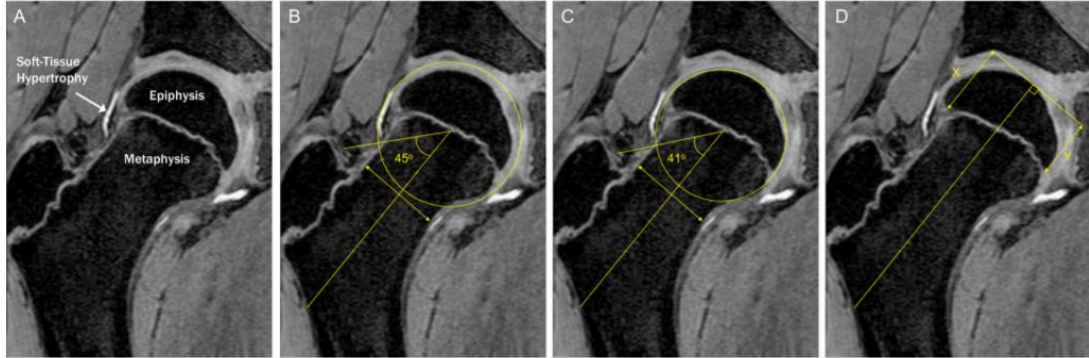
YOUTH ACTIVITY LABRAL TEARS

Original article



Physical activity during adolescence and the development of cam morphology: a cross-sectional cohort study of 210 individuals

Antony Palmer,¹ Scott Fernquest,¹ Mo Gimpel,² Richard Birchall,² Andrew Judge,^{1,3} John Broomfield,¹ Julia Newton,¹ Mark Wotherspoon,² Andrew Carr,¹ Sion Glyn-Jones¹



HIP IMPINGEMENT & SPORTS

Review

Athletic groin pain: a systematic review of surgical diagnoses, investigations and treatment

Darren de SA,¹ Per Hölmich,^{2,3} Mark Phillips,⁴ Sebastian Heaven,¹ Nicole Simunovic,⁴ Marc J Philippon,⁵ Olufemi R Ayeni¹

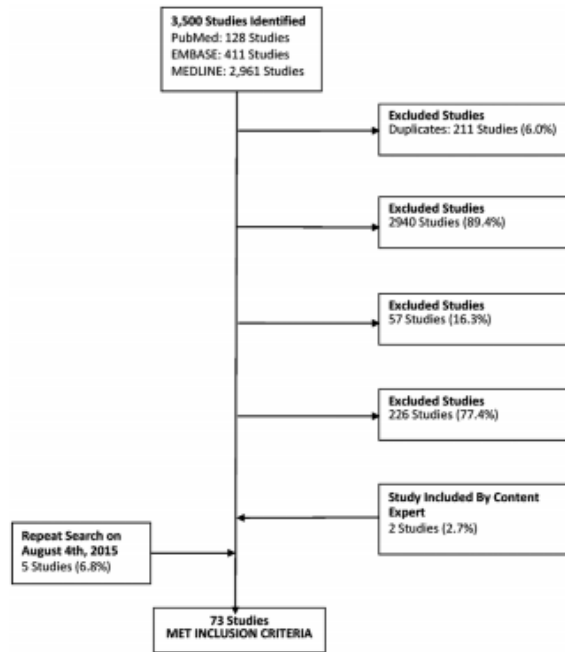


Figure 1 Systematic search of the literature addressing causes of groin pain in athletes requiring surgery.



Review

Table 1 Top five surgical causes of groin pain in athletes

Cause	Patients (n)	Reported mean age (range)	Male (%)	Pathology breakdown	Patients (n)
Femoroacetabular impingement*	1510	27.91 (15–41)	59.19%	Cam	111
				Pincer	2
				Mixed	90
				Not stated	1344
Sports hernia/athletic pubalgia	1122	25.76 (20.7–43.2)	98.00%		
Adductor-related pathology	570	25.23 (23–34)	99.22%	Tendonitis	84
				Rupture/lesion/avulsion	7
				Strain	16
				Not stated	463
Inguinal pathology	473	26.04 (19–41)	96.61%	Inguinal hernia	173
				Inguinal wall deficiency	178
				Inguinal ligament pathology	122
Labral pathology	220	27.95 (14–31.7)	54.30%	Isolated tear	29
				FAI-associated tear	76
				Other pathology+tear	46
				Not stated	69

*Pathology breakdown does not equal total number of patients due to bilateral procedures in individual patients. FAI, femoroacetabular impingement.

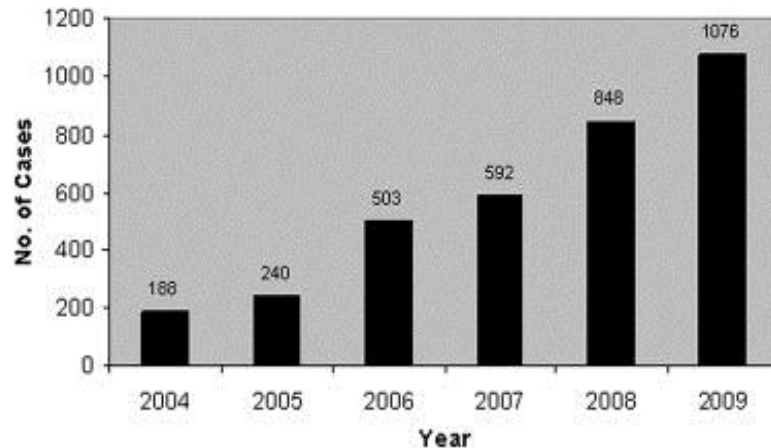
Table 2 Top three sports causing top five surgical causes of groin pain in athletes

Injury	Top 3 sports	Patients (n)
FAI	1. Ice hockey	67
	2. Soccer	67
	3. Baseball	24
Athletic pubalgia	1. Soccer	368
	2. Ice hockey	69
	3. Football	23
Adductor-related pathology	1. Soccer	298
	2. Aus. rules football	31
	3. Football	17
Inguinal-related pathology	1. Soccer	52
	2. Aus. rules football	13
	3. Ice hockey	6
Labral pathology	1. Ice hockey	31
	2. Rowing	18
	3. Taekwondo	12

FAI, femoroacetabular impingement; Aus., Australian.

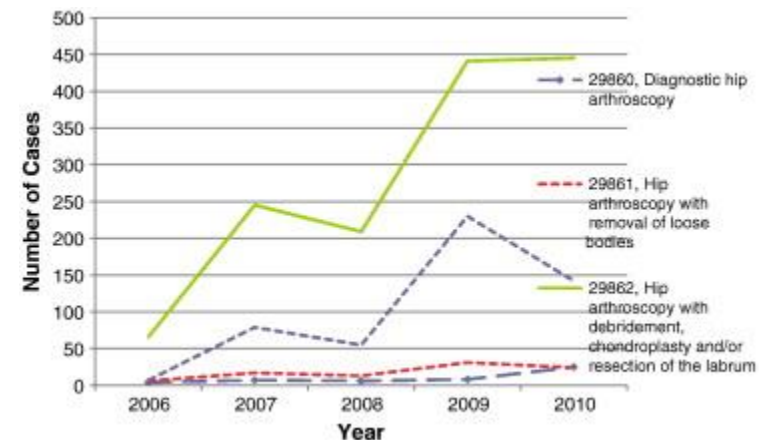
RISE IN HIP ARTHROSCOPY

- Montgomery et al. Trends and Demographics in Hip Arthroscopy in the United States. *Arthroscopy*. 2013; 9(4): 661-665.
- **“A 365% increase in the rate of hip arthroscopy was observed in the examined cohort of patients between 2004 and 2009”**



- Bozic et al. Trends in Hip Arthroscopy Utilization in the United States. *J Arthroplasty*. 2013; 28 (8): 141-143.

“600% increase in hip arthroscopy during the 5-year period under study from approximately 83 in 2006 to 636 in 2010 by part II Orthopaedic Board Examinees.”



FAI & OA: IS THERE A LINK?

REVIEW ARTICLE

Does Femoroacetabular Impingement Contribute to the Development of Hip Osteoarthritis? A Systematic Review

Marcin Kowalczyk, MD,* Marco Yeung, MD,* Nicole Simunovic, MSc,†
and Olufemi R. Ayeni, MD, MSc, FRCSC*



Volume 23 | Number 4 | 2015

Abstract: Femoroacetabular impingement (FAI) has been linked to specific patterns of cartilage damage. The goal of this systematic review is to answer the following questions: (1) Does FAI contribute to the development and progression of hip osteoarthritis (OA)? (2) If FAI does contribute to the development and progression of hip OA, does CAM-type or pincer-type impingement play a greater role? A search of the electronic databases, MEDLINE and EMBASE, was performed to identify relevant studies performed between January 1, 2000 and January 1, 2015 that link the pathophysiology of OA to FAI. Methodological quality of included studies was assessed by 2 reviewers using the Methodological Index for Non-Randomized Studies criteria. An intraclass correlation coefficient with 95% confidence intervals was used to determine agreement between reviewers on quality scores. Overall

Certain morphologic features of CAM-type FAI, particularly elevated alpha angle, do seem to predispose select patients to radiographic progression of hip OA. In comparison with pincer-type impingement, the association between CAM-type impingement and hip OA is better understood. Long-term surgical outcome studies will further delineate the role of FAI in the development and progression of hip OA.

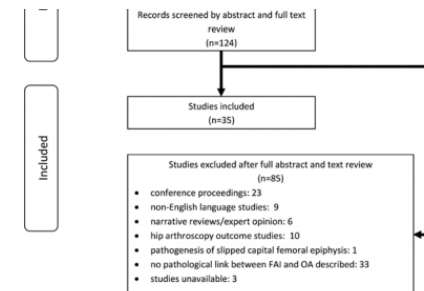
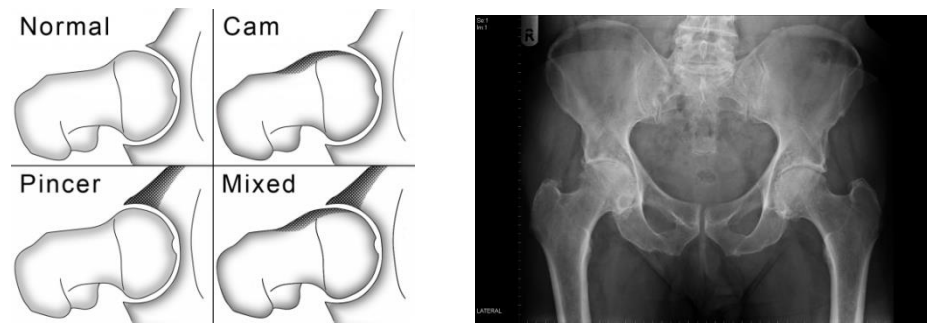
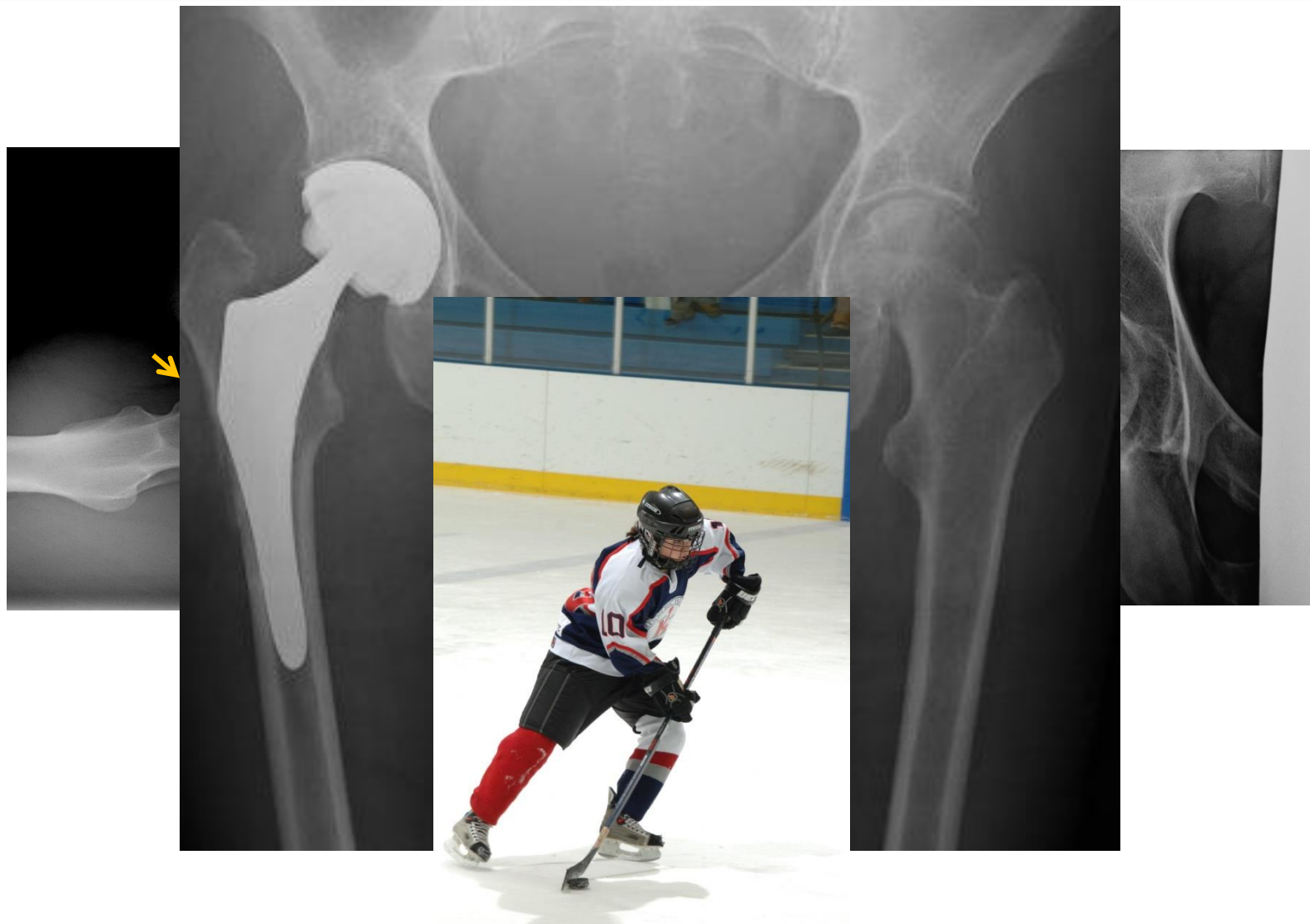


FIGURE 1. Search results and study selection. FAI indicates femoroacetabular impingement; OA, osteoarthritis.

Can we stop the development of Hip Osteoarthritis (OA)?

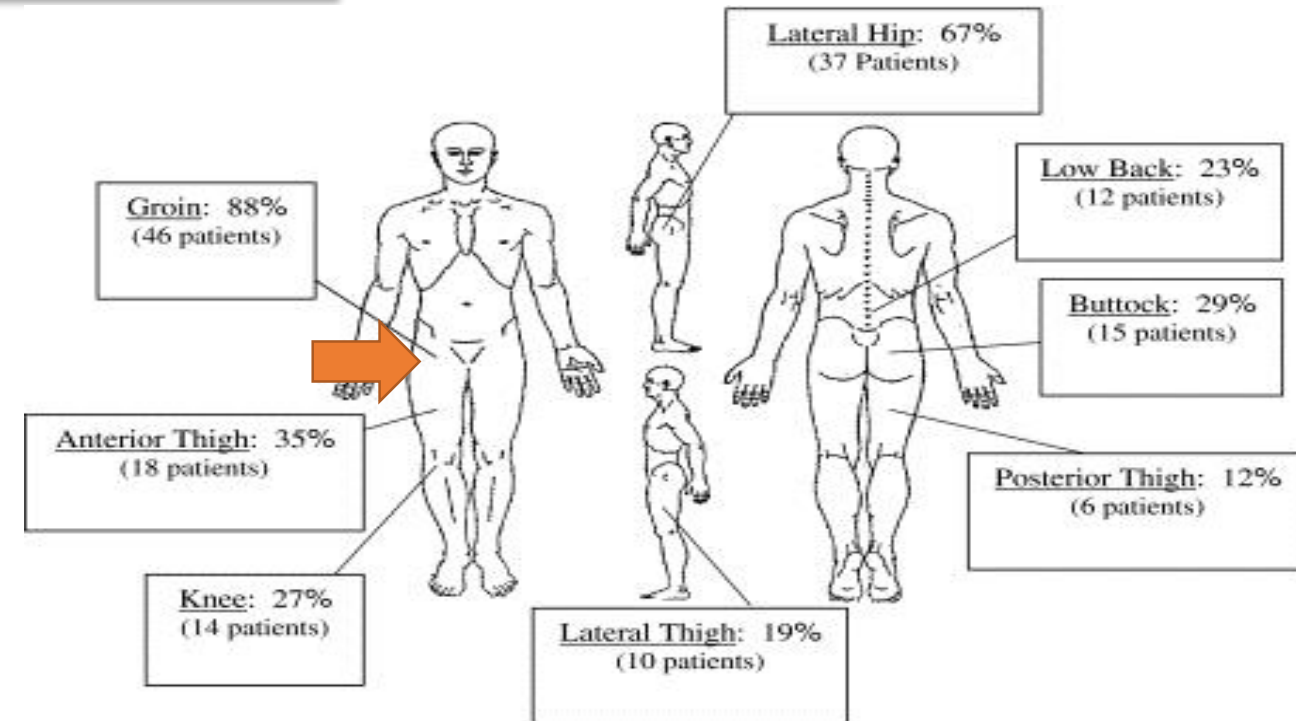


DIAGNOSTIC STEPS

Clinical Presentation of Patients with Symptomatic Anterior Hip Impingement

John C. Clohisy MD, Evan R. Knaus DO,
Devyani M. Hunt MD, John M. Leshner MD,
Marcie Harris-Hayes PT, Heidi Prather DO

Abstract Femoroacetabular impingement (FAI) is considered a cause of labrochondral disease and secondary osteoarthritis. Nevertheless, the clinical syndrome associated with FAI is not fully characterized. We determined the clinical history, functional status, activity status, and physical examination findings that characterize FAI. We prospectively evaluated 51 patients (52 hips) with symptomatic FAI. Evaluation of the clinical history, physical exam, and previous treatments was performed. Patients



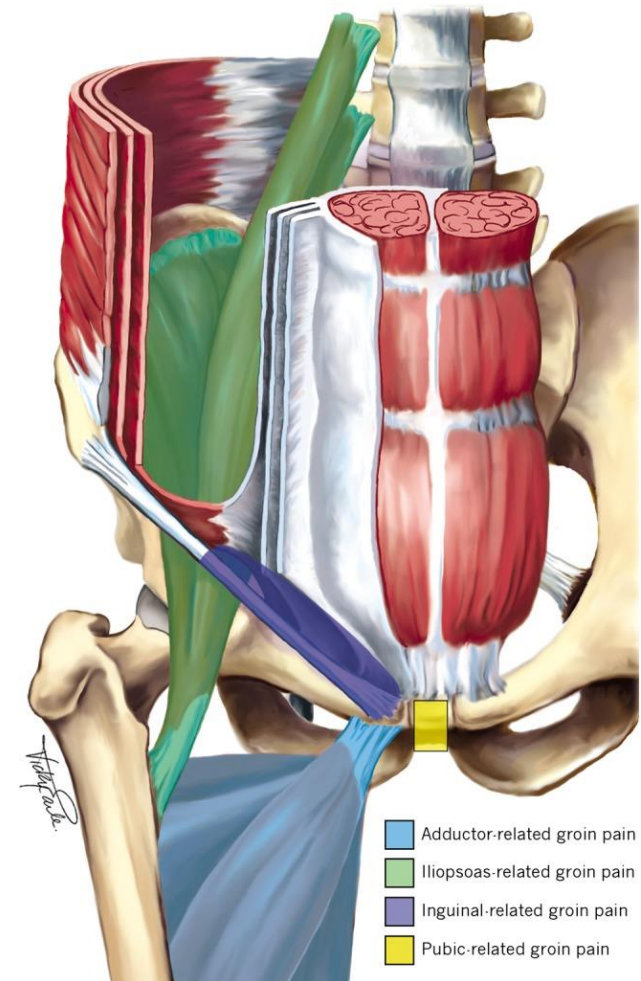
CLINICAL ORTHOPAEDICS
AND RELATED RESEARCH®

A publication of The Association of Bone and Joint Surgeons®

2009;467(3):638-644.

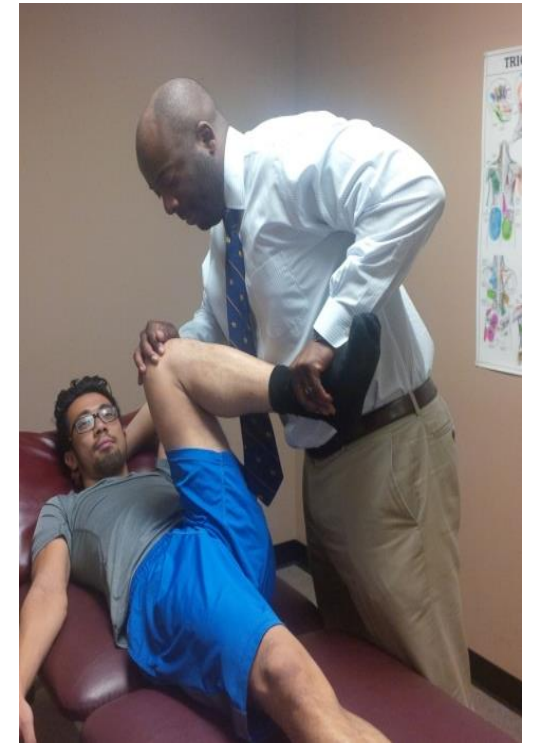
DIFFERENTIAL DIAGNOSIS OF HIP PAIN

- Musculoskeletal
 - Tendinopathy/Tendonitis
- Genitourinary
 - Epididymitis
- Gynaecological
 - Ovarian Cyst/PID
- Neurologic
 - L1-L2-L3
- Abdominal
 - Appendicitis/Hernia



HIP SPECIFIC EXAM

- Standing
 - Gait, Alignment
- Seated
 - Modified straight leg raise, Neurovascular, Strength
- Supine
 - ROM,
 - Provocative testing: Log roll, **FADIR**, FABER, Resisted sit up/adduction
- Lateral Decubitus
 - Palpation, Abductor strength/contractures
- Prone
 - Hip Contractures, Version, Lumbar spine palpation



FAI: IMAGING MODALITIES

- X rays
- MRI (arthrogram)
- Computed Tomography Scan
- Ultrasound
- Diagnostic Injection



INTRA ARTICULAR HIP INJECTION

HIP

Pre-operative intra-articular hip injection as a predictor of short-term outcome following arthroscopic management of femoroacetabular impingement

Olufemi R. Ayeni · Forough Farrokhyar ·
Sarah Crouch · Kevin Chan · Sheila Sprague ·
Mohit Bhandari

Received: 9 September 2013 / Accepted: 25 January 2014 / Published online: 5 February 2014
© Springer-Verlag Berlin Heidelberg 2014

- PROSPECTIVE COHORT OF 52 PATIENTS
- PAIN DIARY DOCUMENTING PAIN RELIEF FOR 2 WEEKS AFTER IA HIP INJECTION
- HIP OUTCOME SCORES MEASURED AT 6 MONTHS



Conclusion In this study, the data suggests that a positive response from an intra-articular hip injection is not a strong predictor of short-term functional outcomes following arthroscopic management of FAI. However, a negative response from an intra-articular hip injection may predict a higher likelihood of having a negative result from surgery.
Level of evidence Level II.

UTILITY OF HIP INJECTION

- History (GROIN PAIN)
- Physical Exam (FADIR)
- Imaging (FAI/TEAR)
- Diagnostic Injection (RELIEF)

Khan M, Bedi A, Fu F, Karlsson J, Ayeni OR, Bhandari M. Nat Rev 2016, 12 (5) 303-310.

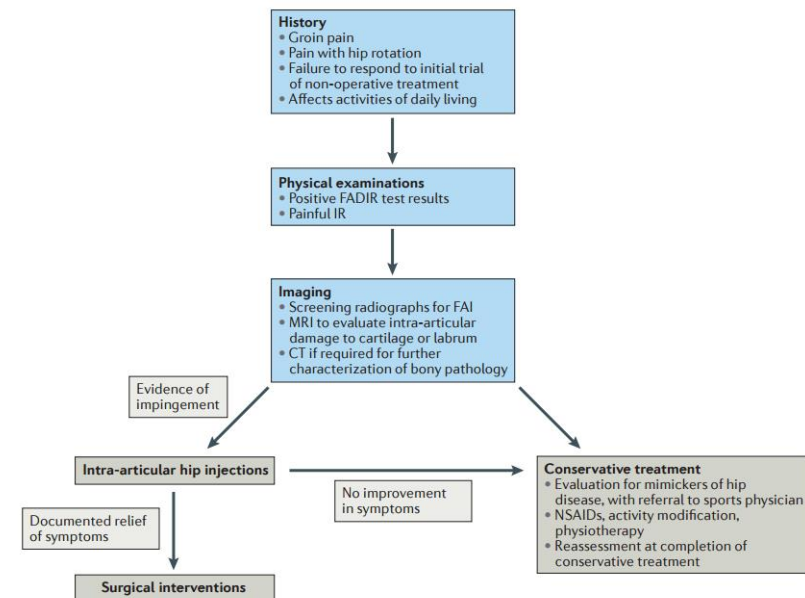


Figure 4 | Diagnostic approach to guide surgical and conservative management of femoroacetabular impingement (FAI). FADIR, flexion-adduction-internal rotation; IR, internal rotation.

CASE EXAMPLE

• HISTORY

- 28 y.o. professional ice hockey player
- No significant medical comorbidities
- 6 months of worsening R hip pain
- Limited hip flexion and rotation
- No relief with rest (2 months), physical therapy and anti-inflammatory medication

• PHYSICAL EXAMINATION

- Full range of motion/strength
- **Positive & Painful FADIR TEST**
- Negative testing for sports hernias



FADIR TEST: HIP

General Review

How Useful Is the Flexion–Adduction–Internal Rotation Test for Diagnosing Femoroacetabular Impingement: A Systematic Review

Ajaykumar Shanmugaraj, BHS (Cand),* Jaymee R. Shell, MD (Cand),† Nolan S. Horner, MD,‡ Andrew Duong, MSc,‡ Nicole Simunovic, MSc,§ Soshi Uchida, MD, PhD,¶ and Olufemi R. Ayeni, MD, PhD‡

Abstract

Objective: Clinicians use the flexion, adduction, and internal rotation (FADIR) test in the diagnosis of femoroacetabular impingement (FAI). However, the diagnostic utility of this test remains unclear. The purpose of this review was to determine the utility of the FADIR test in diagnosing FAI. **Data Sources:** MEDLINE, EMBASE, and PubMed were searched using relevant key terms and study screening was performed in duplicate. Patient demographics, diagnostic imaging, and summary measures (eg sensitivity, specificity, etc.) of the FADIR test in patients with FAI were recorded. **Main Results:** Eight studies of levels III (87.5%) and IV (12.5%) evidence were included. Four hundred fifty-two patients (622 hips) with a mean age of 27.0 ± 9.0 were examined. Alpha (75.1%) and/or center-edge (26.8%) angles were used to diagnose hips with FAI. X-ray (78.9%), magnetic resonance imaging (MRI) (16.2%), and computed tomography (CT) (4.8%) were used to confirm the diagnosis of FAI. The sensitivity when confirmed by x-ray, MRI, or CT was 0.08 to 1, 0.33 to 1 and 0.90, respectively. The specificity when confirmed by x-ray and MRI was 0.11 and 1, respectively. **Conclusions:** Although the overall utility of the FADIR test in diagnosing FAI remains unclear given its moderate sensitivity and specificity, it may be a useful screening tool for FAI because of its low risk. Clinicians should consider the variability in sensitivity and specificity values reported and the low quality of literature available. Future studies should use large sample sizes and consistent radiographic measurements to better understand the usefulness of this physical examination maneuver in diagnosing FAI. **Level of Evidence:** Level IV, Systematic Review of Level III and IV studies.

Key Words: femoroacetabular impingement, FADIR, hip, review

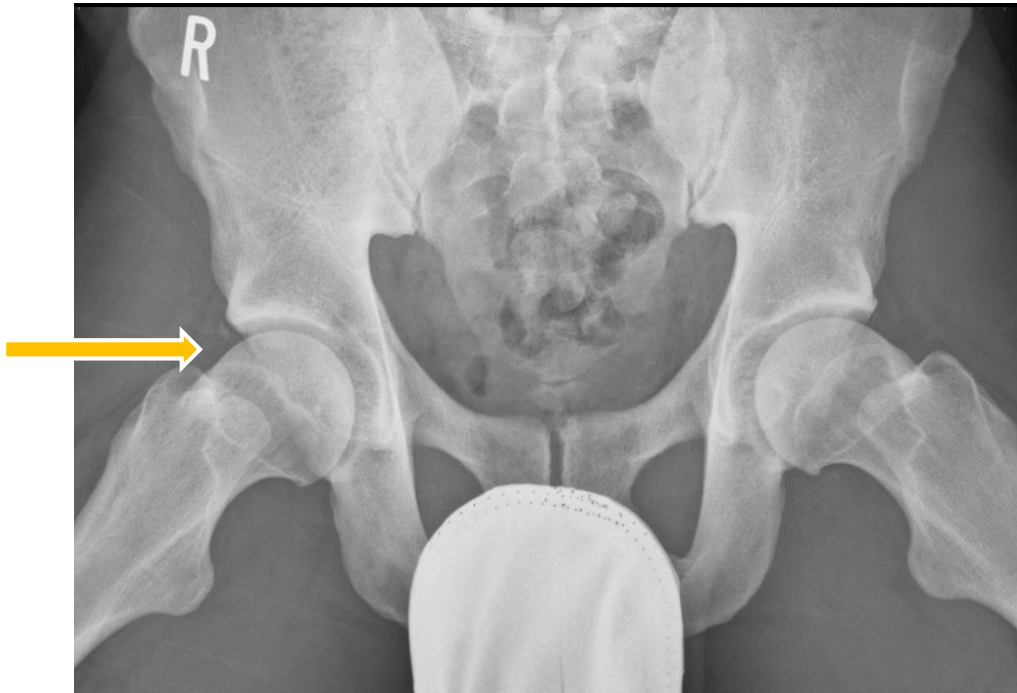
(*Clin J Sport Med* 2018;0:1–7)

- Moderate sensitivity and moderate specificity
- Not entirely diagnostic but can be helpful

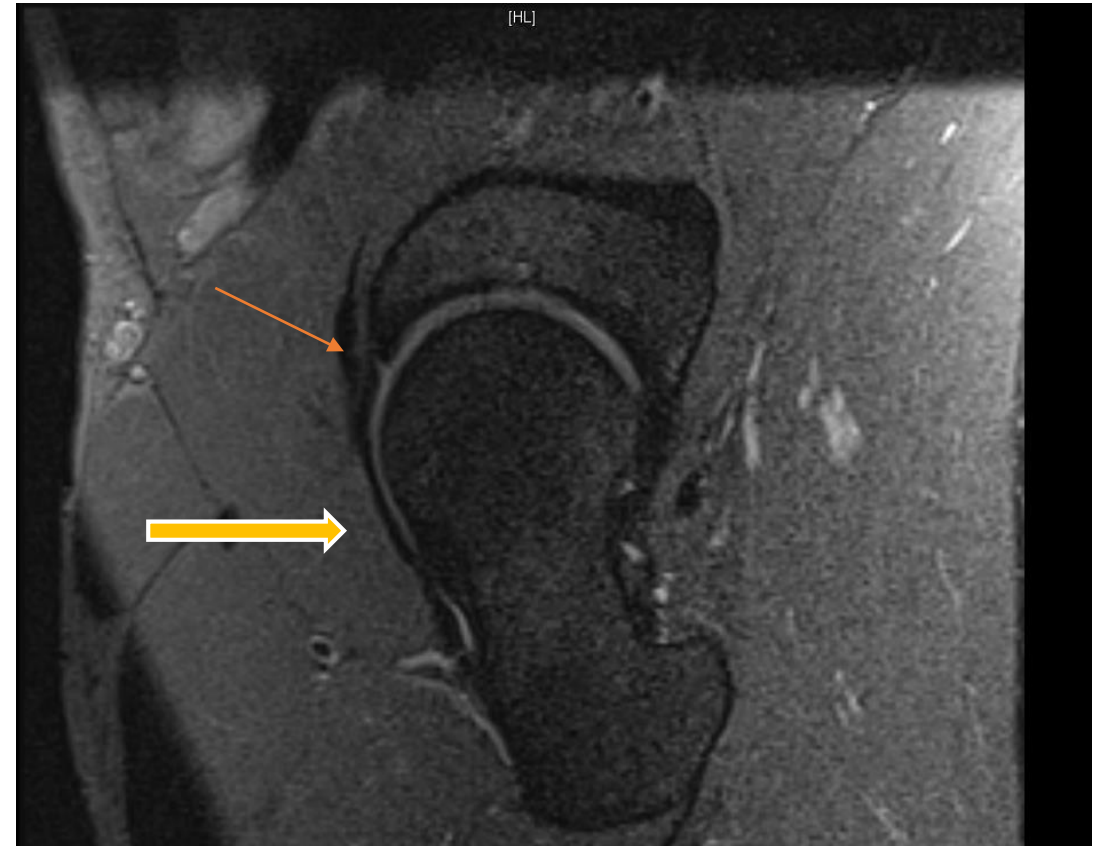


CASE EXAMPLE: IMAGING

- **XRAY Frog Lateral**



- **MRI (Axial)**



HIP JOINT ACCESS

- General/Spinal Anesthetic
 - Full Muscle Paralysis
- Supine or Lateral Positioning
 - With all extremities well padded
- Well Padded Peroneal Post
 - Protection of Pudendal Nerve



SURGICAL EQUIPMENT

- Instruments needed:
- Spinal needle
- 11 blade
- 20 cc syringe
- Kelly clamps
- Scope trochars
- Slotted cannulas
- Guidewire
- Switching stick
- Banana blade

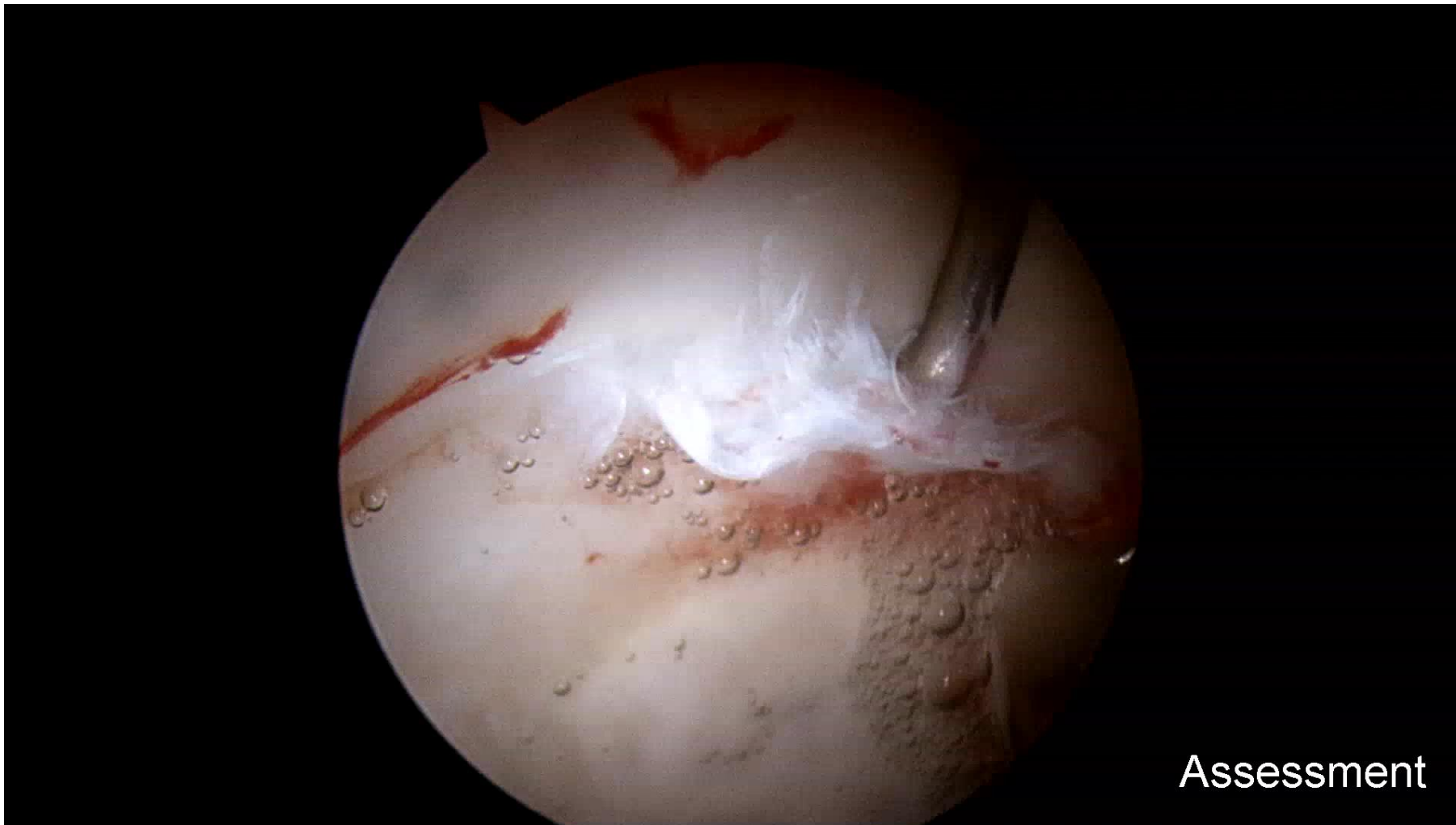




FAI/LABRAL REPAIR: SURGICAL STEPS

SURGICAL ACCESS (PORTALS)

HIP ARTHROSCOPIC (FAI) SURGERY

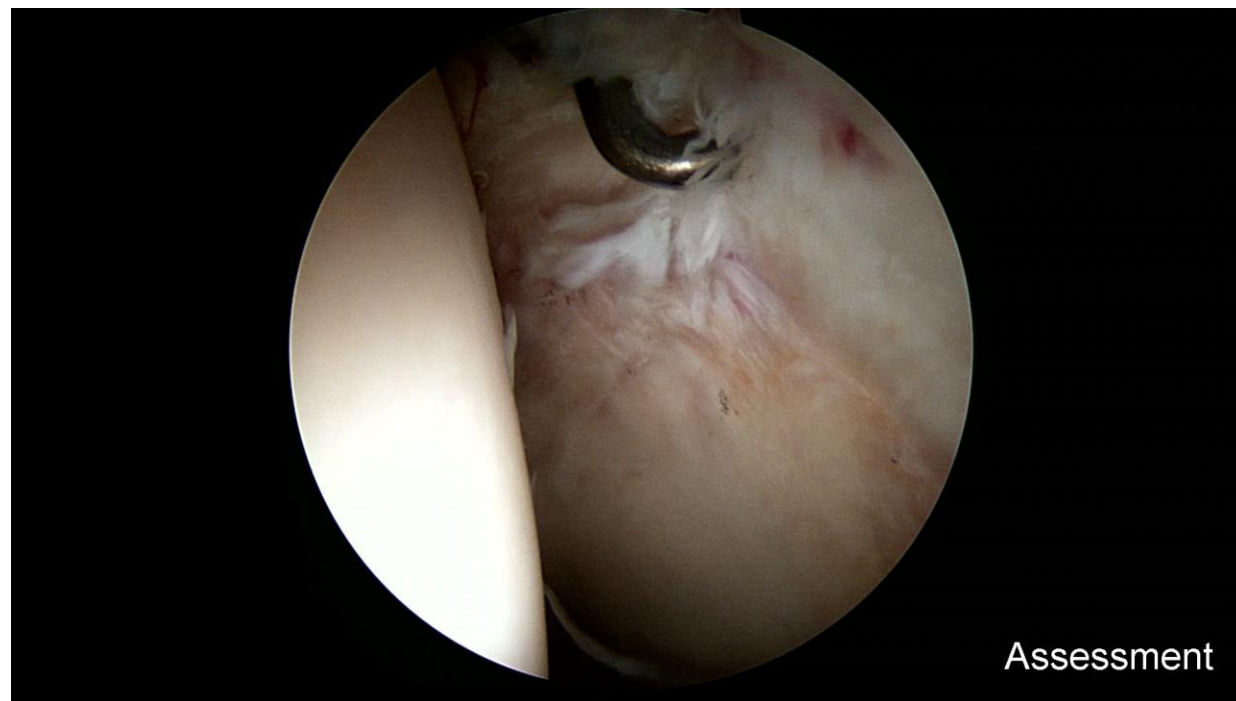


FAI BONY CORRECTION

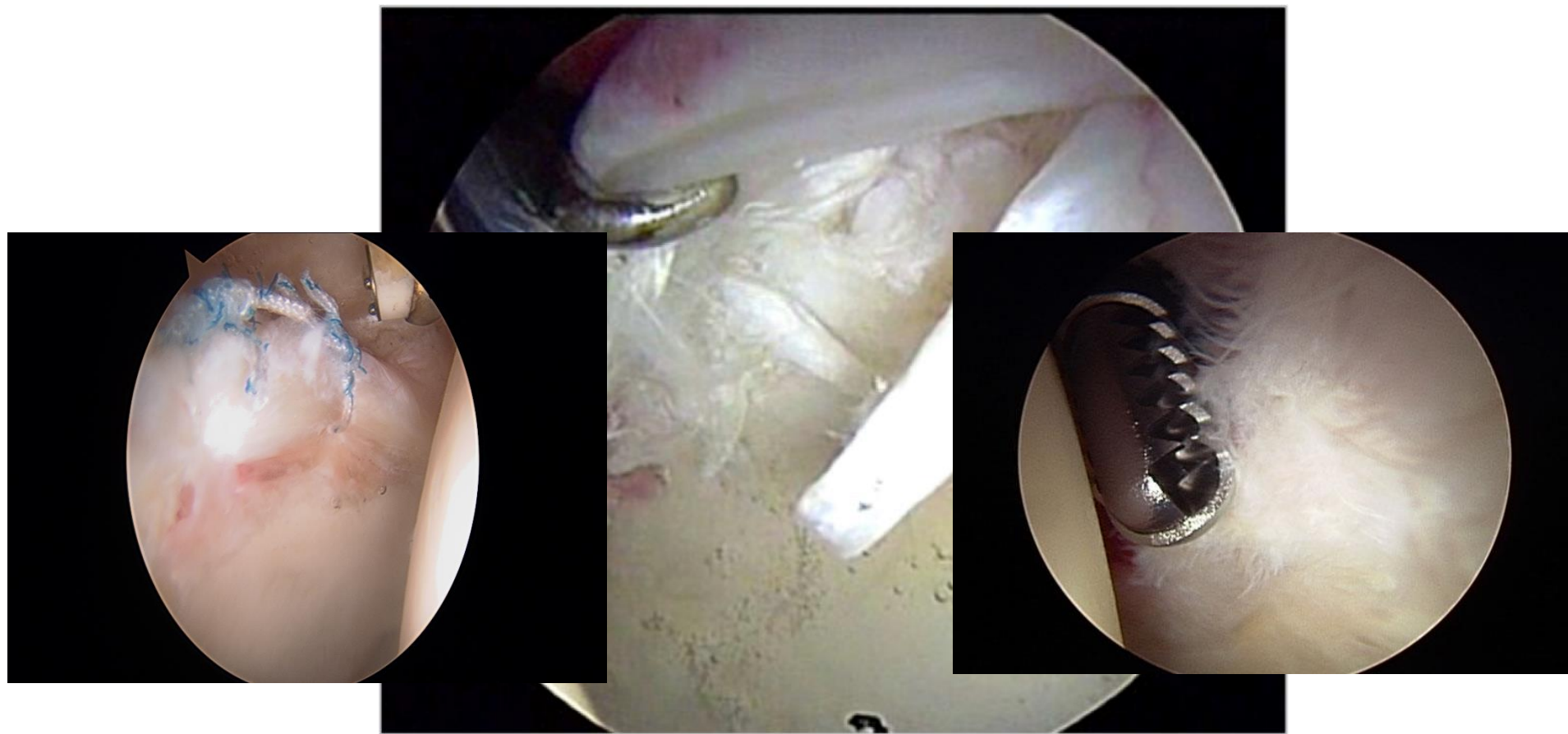


EVIDENCE BASED CASE MANAGEMENT

CASE EXAMPLES: SELECTIVE LABRAL DEBRIDEMENT



HIP LABRAL REPAIR VERSUS DEBRIDEMENT



LABRAL REPAIR VERSUS DEBRIDEMENT

- 6 studies (490 patients)
- Modified Harris Hip Score – Clinically important difference in favor of labral repair (7.4 points)
- **Statistically significant** improvements in repair over debridement

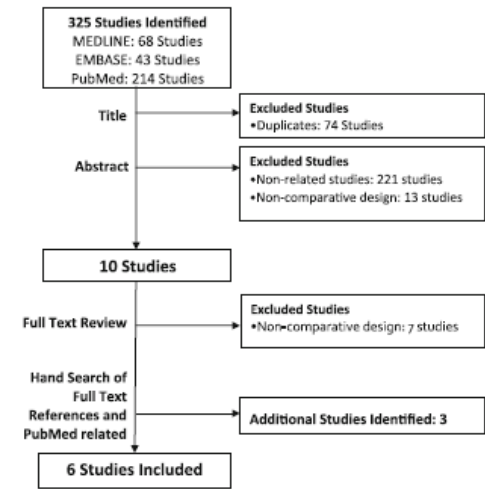
Knee Surg Sports Traumatol Arthrosc (2014) 22:756–762
DOI 10.1007/s00167-014-2886-8

HIP

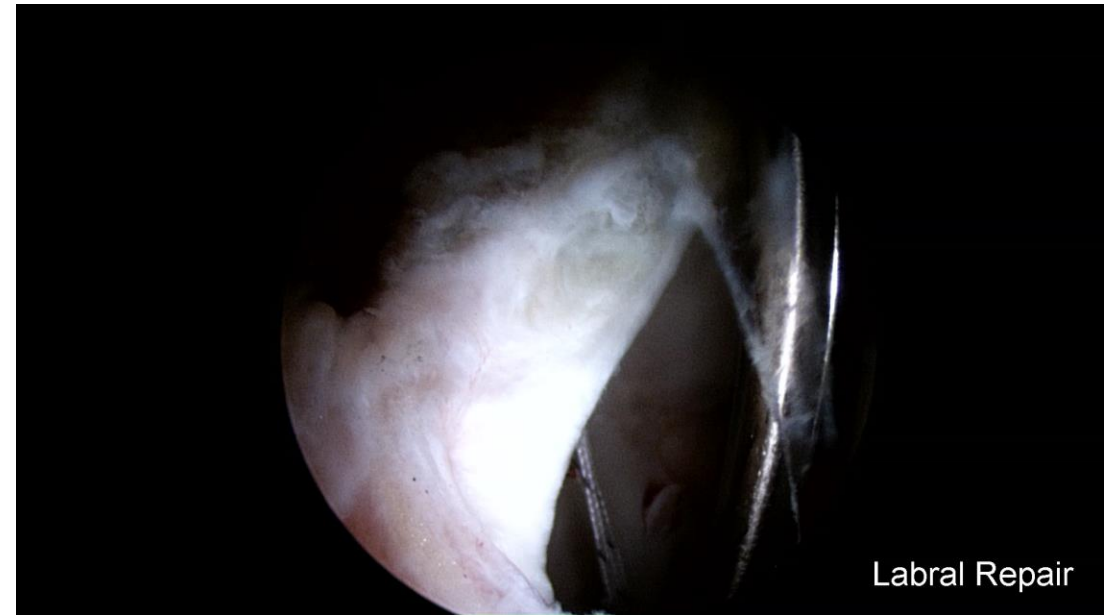
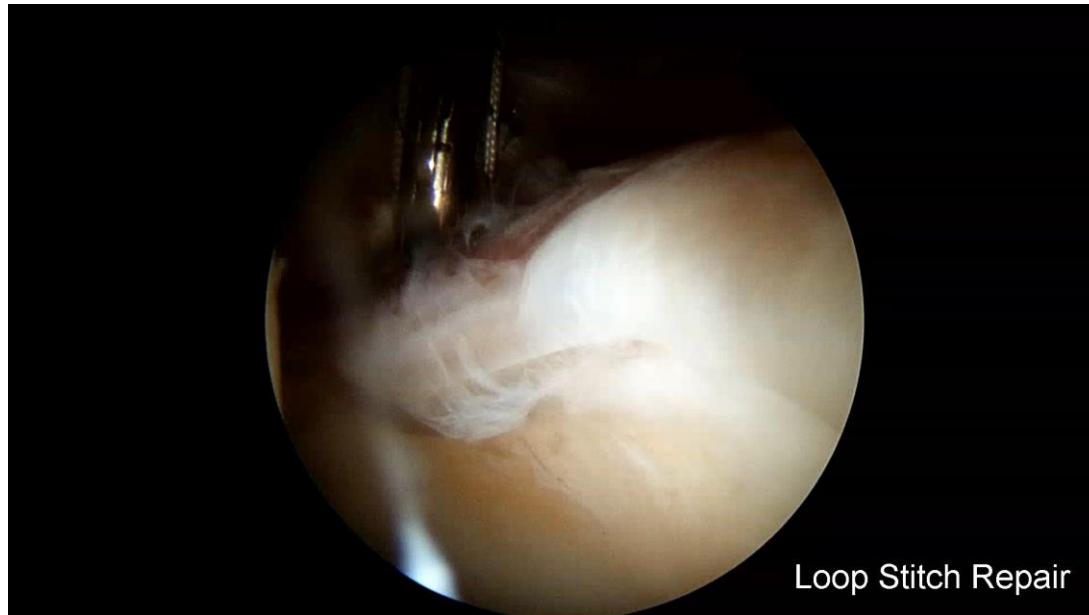
Surgical management of labral tears during femoroacetabular impingement surgery: a systematic review

O. R. Ayeni · J. Adamich · F. Farrokhyar ·
N. Simunovic · S. Crouch · M. J. Philippon ·
M. Bhandari

KSSTA



DOES LABRAL REPAIR TECHNIQUE MATTER?



F = Sawyer et al, AJSM 2015 NO
SIGNIFICANT DIFFERENCE

CASE EXAMPLE

- 36 FEMALE TEACHER
- **2 previous hip arthroscopies**
 - #1 FAI and labral repair
 - #2 ADHESION RESECTION AND LABRAL DEBRIDEMENT
- **Constant activity dependent hip and groin pain**
- Has failed all non surgical modalities
 - Physio/injections/nsaids/massage
- X-ray/CT: No residual FAI
- MRI: Cartilage thinning and Labral intra-substance degeneration/fragmentation



CASE EXAMPLE

LABRAL RECONSTRUCTION



ARTHROSCOPIC LABRAL RECONSTRUCTION

Knee Surg Sports Traumatol Arthrosc (2014) 22:737–743
DOI 10.1007/s00167-013-2804-5

HIP

The hip labrum reconstruction: indications and outcomes—a systematic review

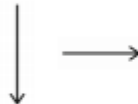
Olufemi R. Ayeni · Hussain Alradwan ·
Darren de Sa · Marc J. Philippon

EMBASE:	1036
MEDLINE:	1356
PUBMED:	103
TOTAL:	2495



DUPLICATES: 650

TOTAL:	1845
--------	------



REMOVED
AFTER TITLE
SCREEN: 1832

ABSTRACTS:	13
------------	----



REMOVED
AFTER
ABSTRACTS: 7

FULL TEXT:	6
------------	---

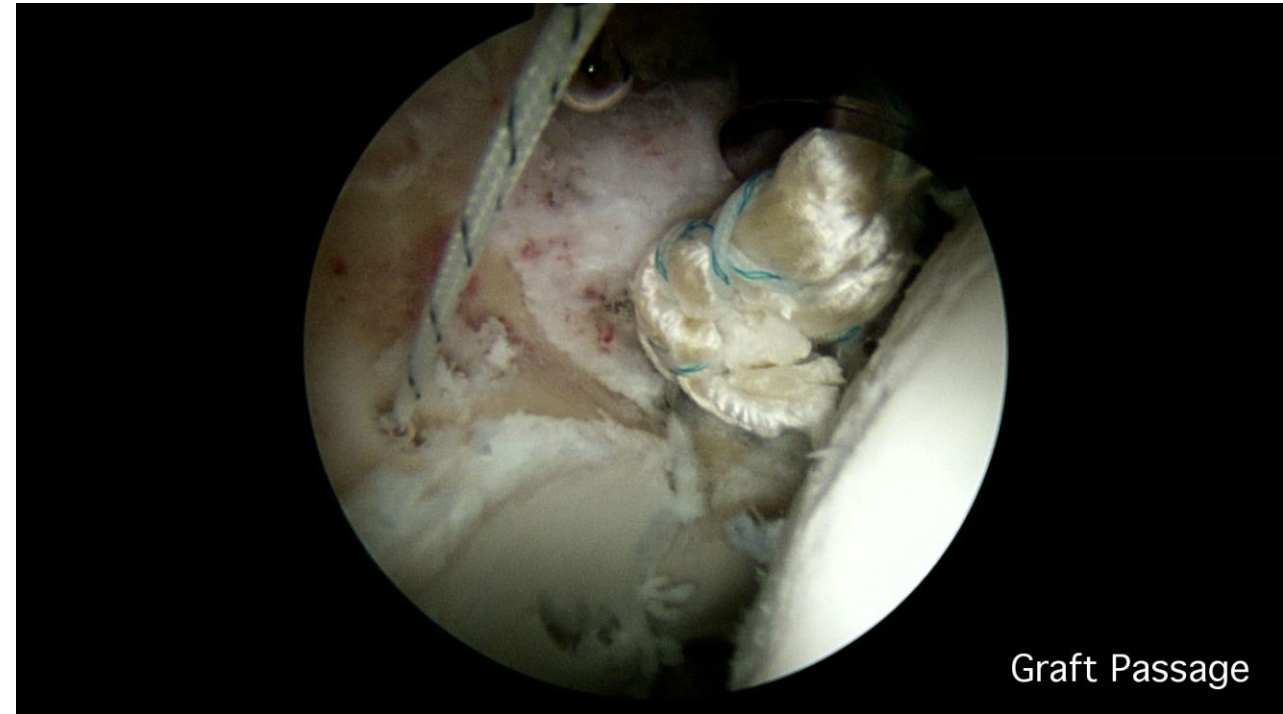


REMOVED
AFTER FULL
TEXT: 1

INCLUDED:	5
-----------	---

73.4% survivorship
in short term

Indications: young
active patient with
irreparable or non
salvageable labrum
and minimal OA



Graft Passage

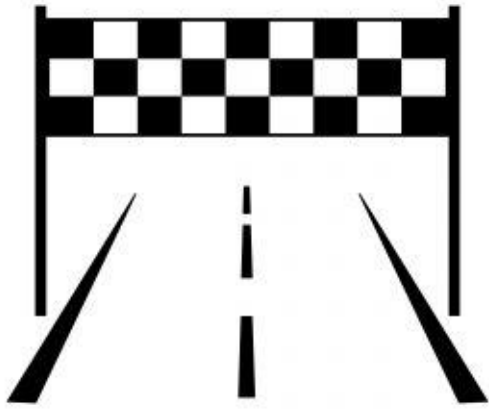
CONTINUUM OF TEAR MANAGEMENT



Labral Debridement -> Labral Repair -> Labral Reconstruction

MANAGEMENT CONTINUUM

BEWARE OF
MORPHOLOGY (X-
RAY)



OUTCOMES

FAI OUTCOME REPORTING: SPORTS

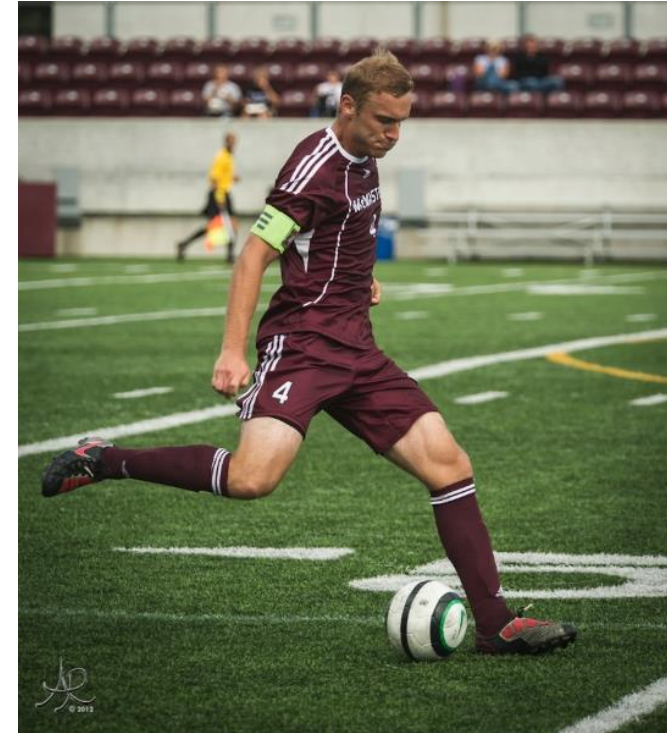
Systematic Review

Return to Preinjury Activity Levels After Surgical Management of Femoroacetabular Impingement in Athletes

Hussain Alradwan, M.D., Marc J. Philippon, M.D., Forough Farrokhyar, M.Phil., Ph.D.,
Raymond Chu, B.H.Sc., Daniel Whelan, M.D., M.Sc., F.R.C.S.C.,
Mohit Bhandari, M.D., F.R.C.S.C., Ph.D., and Olufemi R. Ayeni, M.D., F.R.C.S.C.

Purpose: A systematic review was conducted to identify, assess, and summarize the available evidence pertaining to surgical intervention for femoroacetabular impingement (FAI) in athletes. Summary estimates of treatment effect (proportion with 95% confidence interval [CI]) were calculated specifically for the rate of return to sport. **Methods:** Electronic databases (Medline, Embase, and Cochrane Library) were searched from inception to November 2011. The references of included articles were reviewed for eligible studies. The inclusion criteria were clinical studies, studies involving humans, minimum 6 months' follow-up, exclusive FAI treatment, and focus on athletes. Exclusion criteria were review articles, basic science investigations, radiologic studies, arthroplasty, and nonathlete clinical studies. A quality assessment of the included articles was conducted by 2 reviewers using a quality assessment tool developed by Yang et al. We used a random-effects model (DerSimonian-Laird method) to calculate weighted proportions. Percentages with 95% CIs are reported. **Results:** Nine articles met the inclusion and exclusion criteria in this review. There was 72% agreement (95% CI, 0% to 94%) between the 2 independent reviewers for inclusion and quality assessment of the studies. A total of 418 athletes were surgically treated for FAI and were available for assessment. The rate of return to sport was 92% (95% CI, 87% to 96%), and the rate of return to the previous level of competition was 88% (95% CI, 80% to 94%). **Conclusions:** Despite the limitations of our systematic review, the findings suggest that surgical treatment for FAI resulted in a high return to preinjury activity levels of sports. **Level of Evidence:** Level IV, systematic review of Level IV studies (case series).

Return to Sport as an outcome measure is variable...92% returned and 88% to same pre injury level



FAI OUTCOME REPORTING: SPORTS

HIP



Athletes experience a high rate of return to sport following hip arthroscopy

Muzammil Memon¹ · Jeffrey Kay¹ · Philip Hache² · Nicole Simunovic³ · Joshua D. Harris⁴ · John O'Donnell⁵ · Olufemi R. Ayeni^{1,6}

- **38 studies, 1773 patients**
- **Pooled rate of return 93% & return to same level 82%**
- **Best outcomes in athletes, pediatrics and shorter duration of symptoms**



FAI OUTCOME REPORTING: PEDIATRIC POPULATION

Systematic Review

Femoroacetabular Impingement in Skeletally Immature Patients: A Systematic Review Examining Indications, Outcomes, and Complications of Open and Arthroscopic Treatment

Darren de SA, M.D., Stephanie Cargnelli, M.D. Cand., Michael Catapano, M.D. Cand., Asheesh Bedi, M.D., Nicole Simunovic, M.Sc., Sarah Burrow, M.Sc., M.D., F.R.C.S.C., and Olufemi R. Ayeni, M.D., M.Sc., F.R.C.S.C.

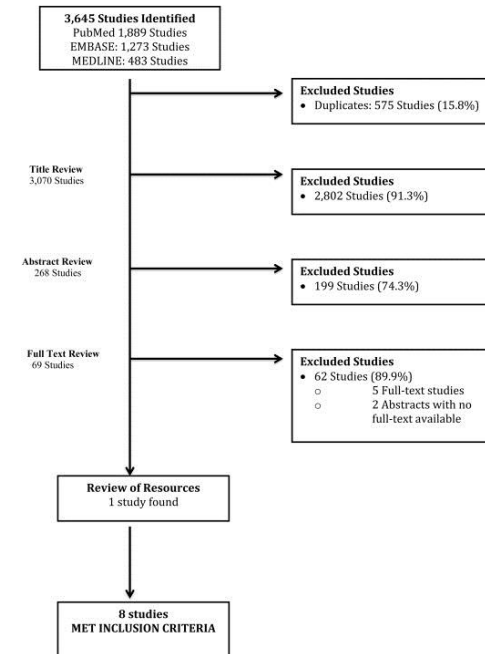


Mean Age: 16.2
84-100% satisfaction arthroscopy
79% satisfaction open
3% revision (combined open/scope)



ARTHROSCOPY

THE JOURNAL OF ARTHROSCOPIC AND RELATED SURGERY



COMPLICATION RATE

Knee Surg Sports Traumatol Arthrosc (2013) 21:1669–1675
DOI 10.1007/s00167-012-2184-2

KSSTA

HIP

Complications following hip arthroscopy: a systematic review and meta-analysis

M. Kowalczyk · M. Bhandari · F. Farrokhyar ·
I. Wong · M. Chahal · S. Neely · R. Gandhi ·
O. R. Ayeni

Abstract

Purpose The use of hip arthroscopy to address injuries and conditions about the hip is becoming more widespread. There are several narrative reviews regarding complications of hip arthroscopy but a systematic review is currently lacking. The primary goal of this study is to determine the complication rate associated with hip arthroscopy in the literature.

Methods A search of the EMBASE and Ovid Medline databases was performed to identify articles published between 1 January 2000 and 25 November 2011 that reported a complication rate after hip arthroscopy. Appropriate inclusion and exclusion criteria were applied to identify articles, and a meta-analysis was performed to determine an overall complication rate. Complications were divided into major and minor.

Results A total of 66 papers ($n = 6,962$ hip arthroscopies) were identified and deemed appropriate for analysis. The overall complication rate was found to be 4.0 % (95 % CI 2.9–5.2 %). Of the 287 complications identified in the

Conclusions Hip arthroscopy appears to be safe. The majority of complications are minor in nature. Prospective trials looking at the complications of hip arthroscopy would aid in identifying prognostic factors.

Level of evidence Systematic review and meta-analysis Level III.

Keywords Hip · Arthroscopy · Complications · Adverse events · Systematic review

Introduction

The arthroscopic appearance of the intra-articular structures of the hip was first described by Burman in 1931 [13]. In his observations, hip arthroscopy has advanced tremendously. The appeal of this technology lies in its ability to provide minimally invasive access to the hip joint, which translates into faster recovery when compared to open surgical techniques [10, 15, 56]. Indications for hip arthroscopy



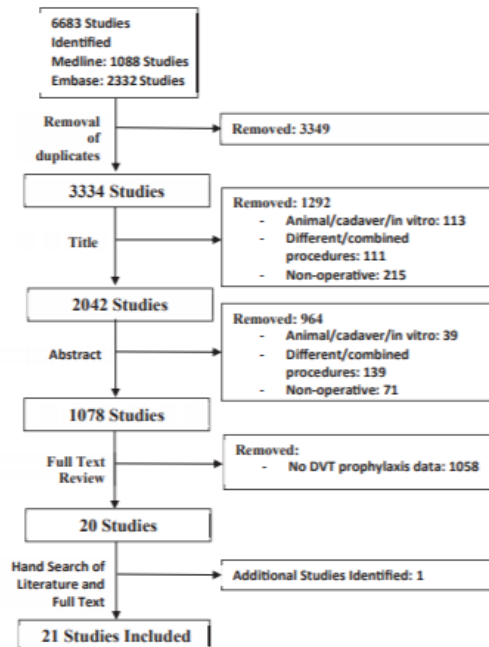
**OVERALL COMPLICATION
RATE OF 4 %
(MAJOR: 0.3%)**

Complication: DVT

Systematic Review

Venous Thromboembolism Events After Hip Arthroscopy: A Systematic Review

Chloe E. Haldane, M.D.(Cand), Seper Ekhtiari, M.D., Darren de Sa, M.D., F.R.C.S.C., Nicole Simunovic, M.Sc., Marc Safran, M.D., Filippo Randelli, M.D., Andrew Duong, M.Sc., Forough Farrokhyar, M.Phil., Ph.D., and Olufemi R. Ayeni, M.D., M.Sc., F.R.C.S.C.



- Incidence of 2%
 - Risk Factors Included:
 - Increased age
 - Obesity
 - Prolonged traction
 - OCP use
 - Trauma
 - Prolonged non weight bearing
- Stratification of risk profile will determine who may need prophylaxis

Complication: Pudendal Neuralgia

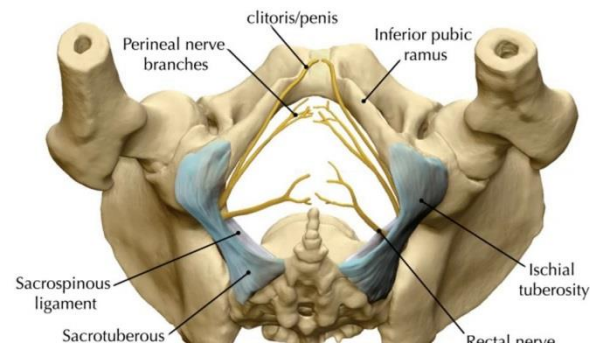
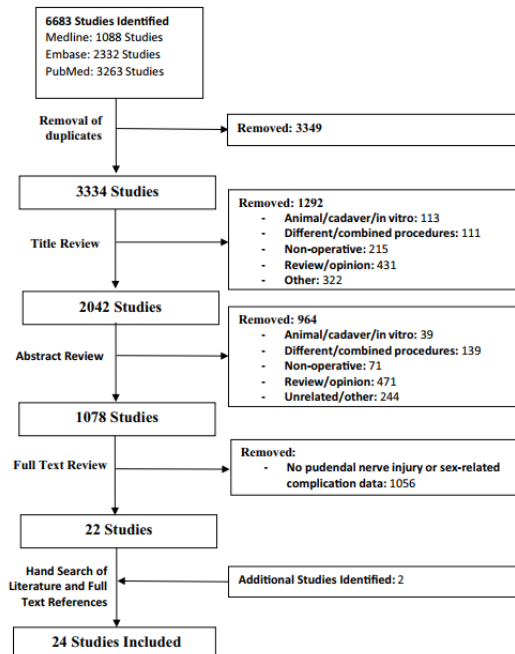
Knee Surg Sports Traumatol Arthrosc
DOI 10.1007/s00167-017-4783-4



HIP

Pudendal nerve injury is a relatively common but transient complication of hip arthroscopy

Anthony Habib¹ · Chloe E. Haldane² · Seper Ekhtiari² · Darren de SA¹ ·
Nicole Simunovic³ · Etienne L. Belzile⁴ · Olufemi R. Ayeni¹



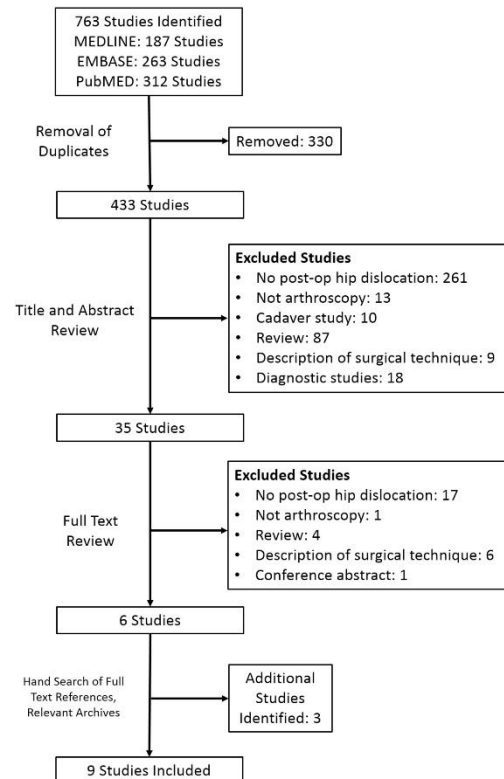
- Pudendal Nerve
 - Urinary and Sexual function
- 1.8 %, typically resolves by 3 months
- Under reported in the literature
- Perineal Post and Long traction times (>90 minutes are risk factors)

Complication: Instability

Systematic Review

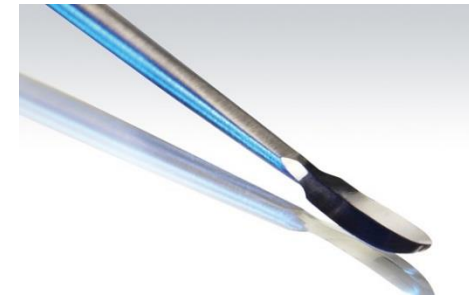
Gross Instability After Hip Arthroscopy: An Analysis of Case Reports Evaluating Surgical and Patient Factors

Marco Yeung, M.D., Muzammil Memon, M.D.(Cand), Nicole Simunovic, M.Sc., Etienne Belzile, M.D., F.R.C.S.C., Marc J. Philippon, M.D., and Olufemi R. Ayeni, M.D., M.Sc., F.R.C.S.C.



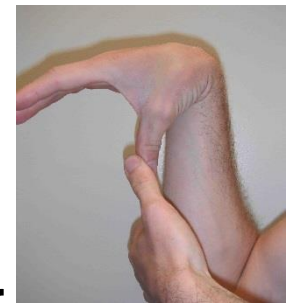
• Common surgical factors

- unrepaired capsulotomy
- iliopsoas release



• Patient factors

- female gender
- acetabular dysplasia
- general ligamentous laxity



• Rehabilitation factors

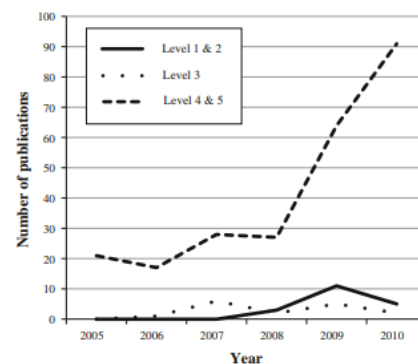
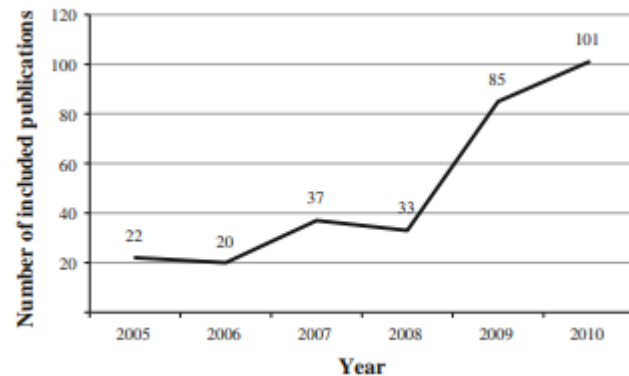
- Unknown and often under reported

FAI EVIDENCE: 2005-2010

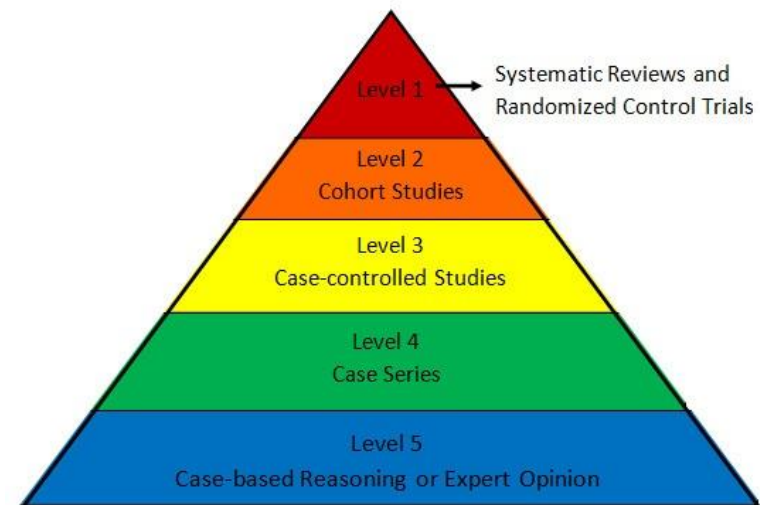
HIP

Sources and quality of literature addressing femoroacetabular impingement

Olufemi R. Ayeni · Kevin Chan · Jamal Al-Asiri ·
Teresa Chien · Sheila Sprague · Susan Liew ·
Mohit Bhandari



- Dramatic rise in FAI related publications
- Multi-Specialty but mostly in Orthopaedics
- Level 4 & 5 studies dominate



*based on the Oxford Centre for Evidence-based Medicine – Levels of Evidence

FAI EVIDENCE: 2011-2015

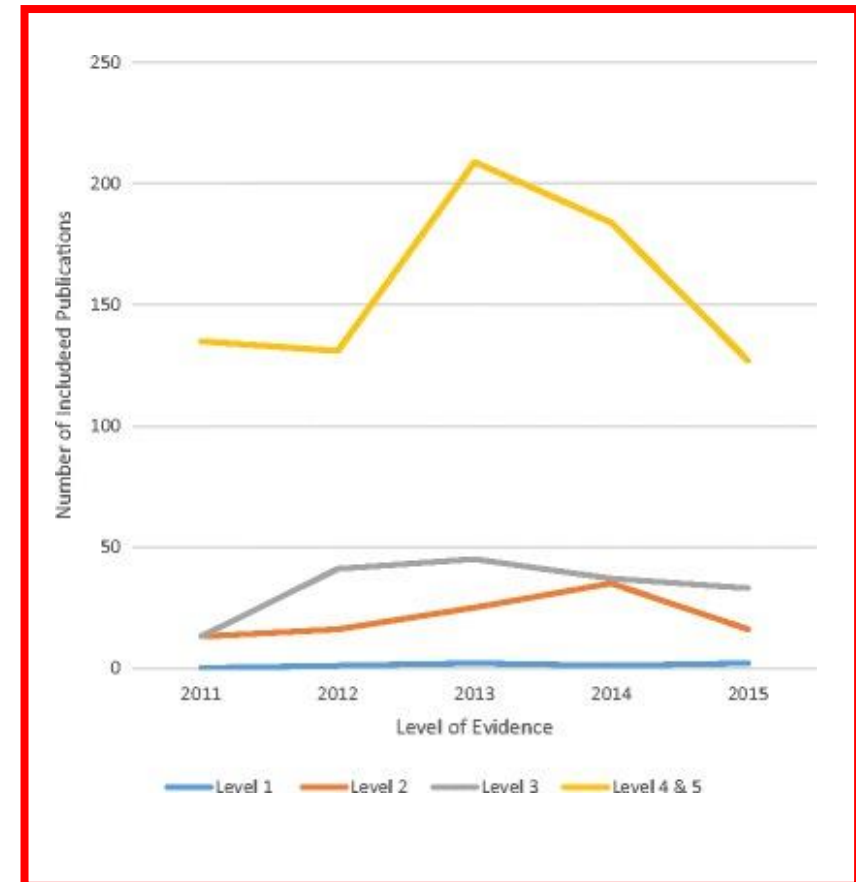
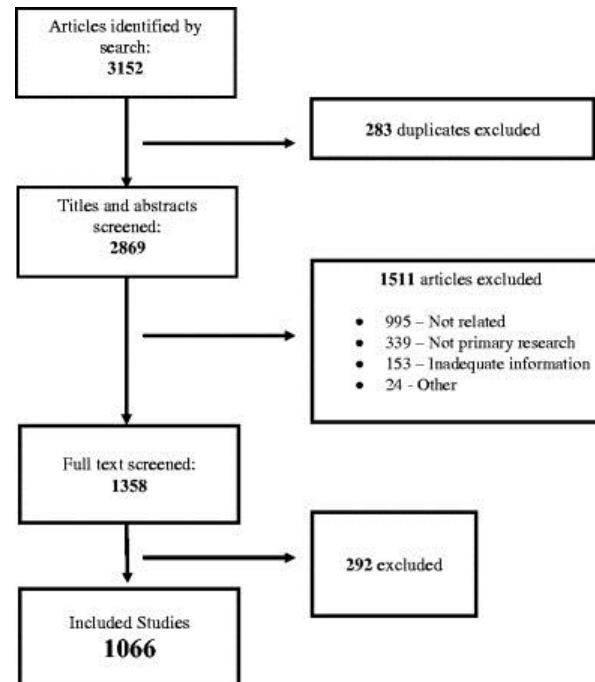
Curr Rev Musculoskelet Med (2016) 9:396–401
DOI 10.1007/s12178-016-9364-5



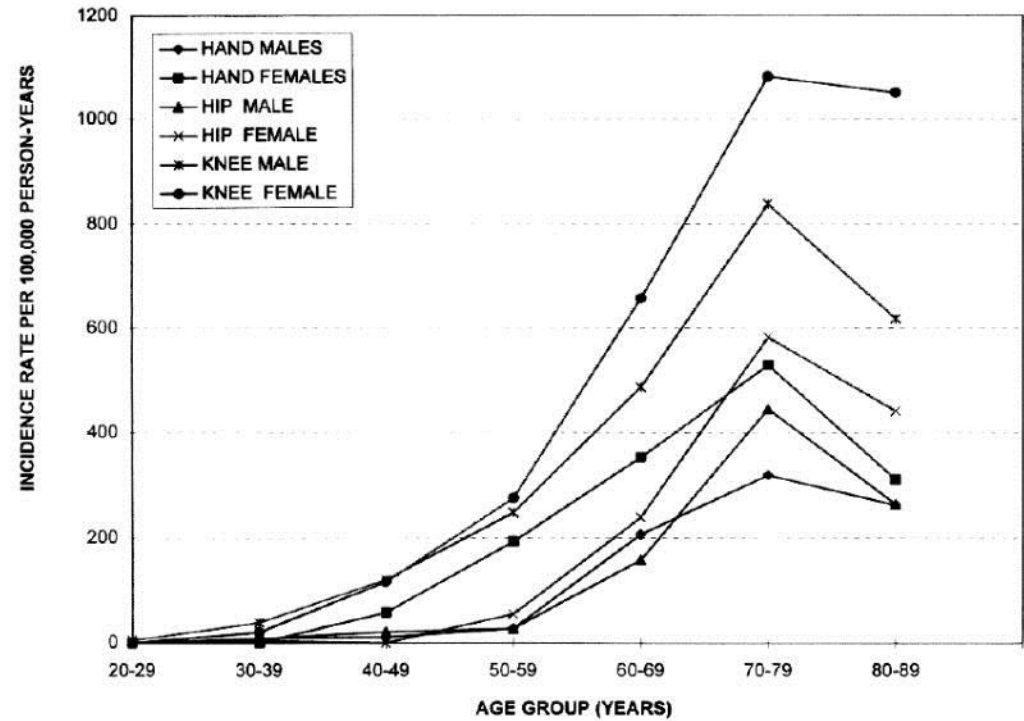
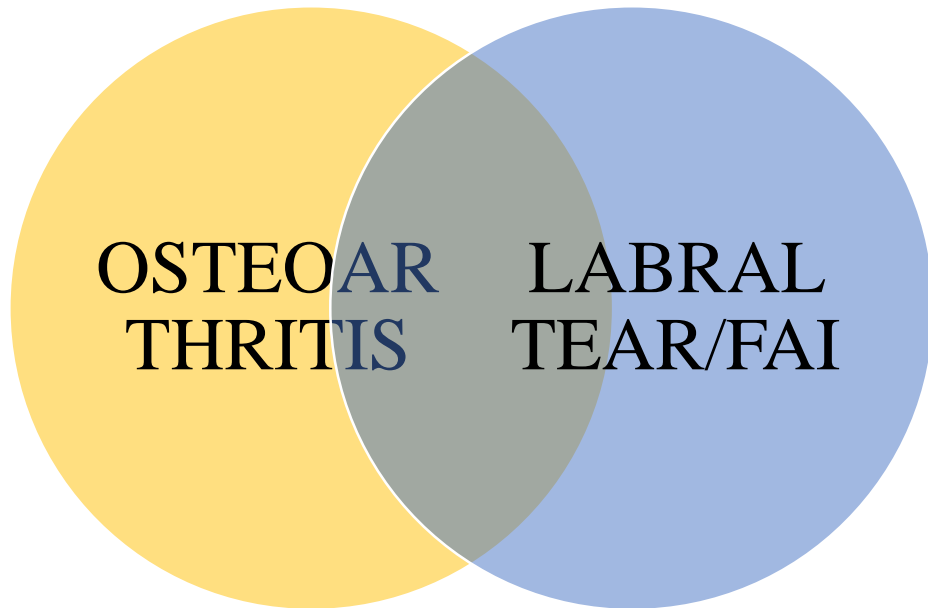
OUTCOMES RESEARCH IN ORTHOPEDICS (O AYENI, SECTION EDITOR)

Sources and quality of literature addressing femoroacetabular impingement: a scoping review 2011–2015

Moin Khan¹ · Kayode O Oduwole¹ · Parul Razdan² · Mark Phillips¹ · Seper Ekhtiari³ · Nolan S Horner³ · Kristian Samuelsson^{4,5} · Olufemi R Ayeni^{5,6}



CLINICAL CHALLENGE: COMBINED DIAGNOSES



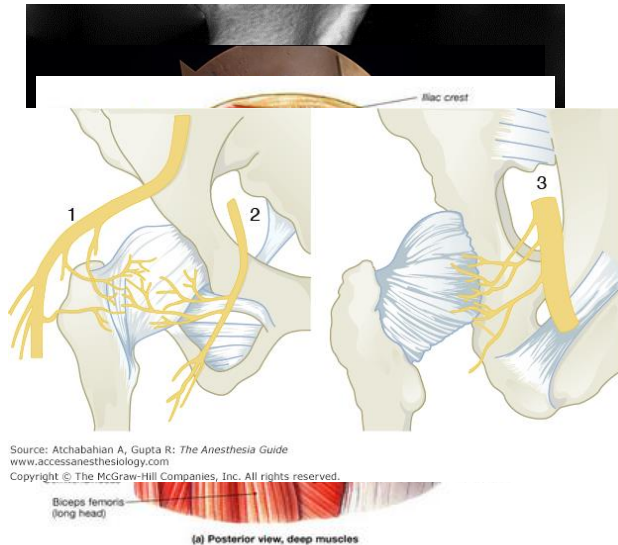
Addressing Hip Pain: Layer Concept

Curr Rev Musculoskelet Med (2012) 5:1–8
DOI 10.1007/s12178-011-9105-8

HIP REHABILITATION (J EDELSTEIN, SECTION EDITOR)

The layer concept: utilization in determining the pain generators, pathology and how structure determines treatment

Peter Draovitch · Jaime Edelstein · Bryan T. Kelly



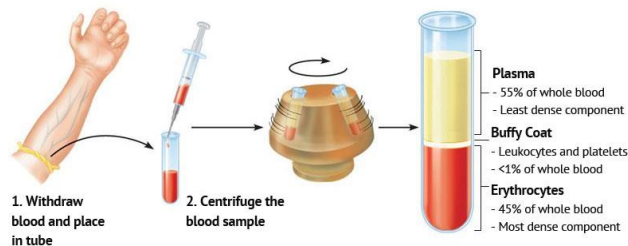
Source: Atchabalian A, Gupta R: *The Anesthesia Guide*
www.accessanesthesiology.com
Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

Layer	Name	Structure	Purpose	Pathology	
I	Osteochondral	Femur	Joint congruence Arthrokinematic movement	Developmental Dysplasia	Dynamic Cam Impingement
		Acetabulum		Femoral Version Acetabular Version	Rim Impingement Trochanteric Impingement Delamination Sub-spine impingement
II	Inert	Innominate	Static Stability	Femoral Inclination Acetabular Profunda/Protrusio	
		Capsule Labrum Ligamentous Complex Ligamentum Teres		Labral Tear Capsular Instability Ligamentum teres tear Adhesive capsulitis	
III	Contractile	Musculature crossing hip	Dynamic Stability	Hemi-pelvic Pubalgia: Anterior Enthesiopathy	
		Lumbosacral muscles Pelvic floor		Hip flexor strain Psoas impingement Rectus femoris impingement Medial Enthesiopathy Adductor tendinopathy Rectus abdominus tendinopathy Posterior Enthesiopathy Proximal hamstring strain Lateral Enthesiopathy Peri-trochanteric space Gluteus medius tear	
III	Neuromechanical	Thoraco-lumbar mechanics	Communication, timing and sequencing of the kinematic chain	Neural	Mechanical
		Lower extremity mechanics Neuro-vascular structures referring to and regional to the hip Regional mechanoreceptors		Nerve entrapment Referred Spinal Pathology	Foot structure and mechanics Scoliosis
				Neuromuscular Dysfunction Pain syndromes	Pelvic posture over femur Osteitis Pubis Pubic symphysis pathology SI dysfunction

CLINICAL CHALLENGE OA/FAI/LABRAL TEAR: OPTIONS

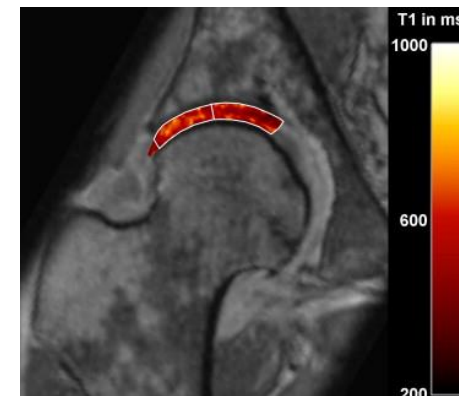
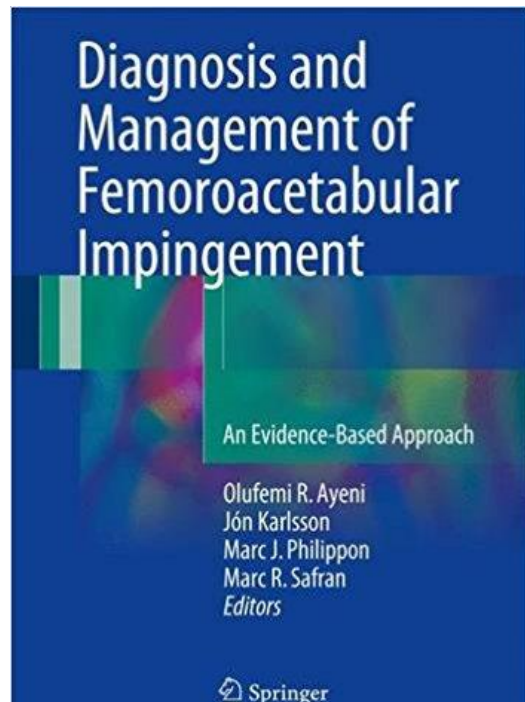
• INDIVIDUALIZED & MULTIMODAL APPROACH:

• COMBINATIONS OF:



FUTURE PERSPECTIVES

- **Transition from Eminence to Evidence**
- **RCT & Long Term Registry Based Studies**
- **Early Detection with cartilage sensitive imaging**
- **Genetic Screening for FAI**





THANK YOU