Femoroacetabular Impingement
An update

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SCHULTHESS CLINIC

Femoroacetabular impingement: World Wide Web

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Femoroacetabular impingement

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10 yrs ago, a novel pathomechnism ...

... called *femoroacetabular impingement (FAI)* was introduced proposing that most, if not all hip OA is 2°, often due to subtle but definite and commonly overlooked developmental deformities of the hip.

Ganz R, et al. *CORR,* 466:264, 2008.

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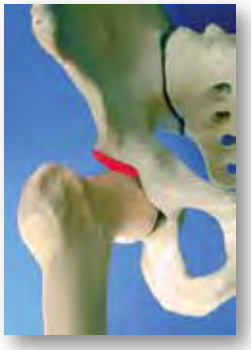
SCHULTHESS CLINIC

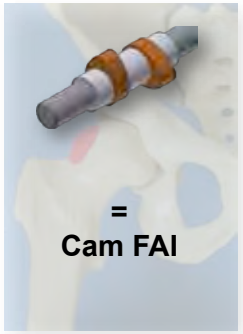
FAI in the native hip: Deformity

Acetabulum	Femur	Combination
		
Overcoverage	Insufficient offset	Both

FAI in the native hip: Damage triggered by motion

Acetabulum	Femur	Combination
		
Overcoverage	Insufficient offset	Both

FAI in the native hip: Classification

Acetabulum	Femur	Combination
		
Overcoverage	Insufficient offset	Both

Concept of FAI: Complex interplay of plevic region

Current Concepts With Video Illustrations

Static and Dynamic Mechanical Causes of Hip Pain

Asheesh Bedi, M.D., Mark Dolan, M.D., Michael Leunig, M.D., and Bryan T. Kelly, M.D.

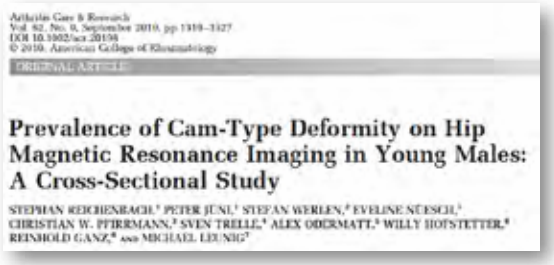
TABLE 2. *Pearls and Pitfalls*

1. Preoperative recognition of the abnormal mechanical factors, as well as intraoperative exposure, visualization, and thorough resection of the offending osseous lesions, is critical to a successful clinical outcome.
2. Isolated treatment of labral pathology with failure to address underlying bony impingement lesions is the most common reason for unsuccessful surgical treatment of FAI.
3. Compensatory motion due to abnormal hip kinematics may adversely affect the dynamic muscle forces in the pelvic region, resulting in secondary adductor, groin, lumbar, and pelvic pain syndromes.
4. In the setting of FAI, the recognition of femoral retroversion is essential, because it amplifies the effect of focal mechanical impingement by rotating an anterosuperior cam lesion into the socket before the initiation of hip flexion.
5. Certain complex, combined patterns of mechanical hip deformity may be best addressed with open surgical dislocation and/or osteotomy procedures or with a combination of open and arthroscopic approaches.
6. There is a high co-incidence of athletic pubalgia and symphyseal stress reaction in patients with FAI, which may result from abnormal motion of the hemipelvis due to restriction of terminal flexion and internal rotation of the hip joint.

Epidemiology: Questions back in 2004

- Prevalence of FAI?
- Association between FAI and hip OA?

Prevalence of cam FAI



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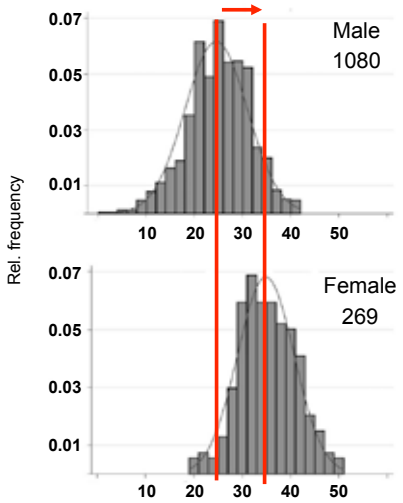
ORIGINAL ARTICLE

Prevalence of Cam-Type Deformity on Hip Magnetic Resonance Imaging in Young Males: A Cross-Sectional Study

STEPHAN REICHENBACH,[1] PETER JÜNI,[1] STEFAN WERLEN,[2] EVELINE NÜESCH,[1] CHRISTIAN W. PFIRRMANN,[3] SVEN TRELLE,[4] ALEX ODERMATT,[5] WILLY HOFSTETTER,[6] REINHOLD GANZ,[6] AND MICHAEL LEUNIG[7]

Results. A total of 1,080 subjects were included in the study and 244 asymptomatic males with a mean age of 19.9 years attended MRI. Sixty-seven definite cam-type deformities were detected. The adjusted overall prevalence was 24% (95% confidence interval [95% CI] 19–30%). The prevalence increased with decreasing internal rotation ($P < 0.001$ for trend). Among those with a clinically decreased internal rotation of <30°, the estimated prevalence was 48% (95% CI 37–59%). Sixty-one of 67 cam-type deformities were located in an anterosuperior position.

Conclusion. Cam-type deformities can be found on MRI in every fourth young asymptomatic male individual and in every second male with decreased internal rotation. The majority of deformities are located in an anterosuperior position.



Increase in females:

10.4° (95% CI 9.5° to 11.2°)

Prevalence of FAI

Authors	Journal	Year	No of pts / age	Imaging	Findings
Gosvig et al.	JBJS Am	2010	3620 / 60 yrs	Standing AP pelvis XR	19.4/5.2% M/F prevalence of pistol grip, 15.2/19.4% M/F prevalence deep socket, deformity not predictive for groin pain but deep socket and pistol grip risk factors for development of OA (relative risks 2.4 and 2.2)
Hack et al.	JBJS Am	2010	200 (400 hips) 29 yrs	MRI radial slice	25% M and 5% F had cam FAI
Kang et al.	AJSM	2010	50 (100 hips)	CT	33% of F, 52% of M with at least one predisposing factor for FAI
Pollard et al.	JBJS Br	2010	96 cases 77 controls 38 yrs	Supine AP pelvis XR and cross-table lateral	2.8 RR of having cam deformity, 2.0 RR of pincer deformity, 2.6 RR of B deformity,
Reichenbach et al.	ArthCare Res	2010	1080 (all M) 20 yrs	MRI	24% prevalence of cam deformity in young M, increases to 48% if decreased IR
Kapron et al.	JBJS Am	2011	67 (134 hips) 21 yrs	AP pelvis, frog lateral XR	Asymptomatic NCAA football players: 91% B head-neck offset <8mm, 61% crossover sign

Association of FAI with OA

Author	Journal	Year	No. of pts / age	Imaging	Findings
Allen et al.	JBJS Br	2009	113 / 38 yrs	AP pelvis and lateral XR	88 pts w/B cam but only 23/88 with B symptoms
Bardakos et al.	JBJS Br	2009	43 / 54 yrs	Supine AP pelvis XR	28/43 with radiographic progression
Audenaert et al.	Acta Ortho Belg	2011	121	AP pelvis and cross-table lateral	No correlation of XR measurements or activity with age at surgery
Clohisy et al.	JBJS Am	2011	604 (710 hips), 118 FAI 43 yrs	AP pelvis and cross-table lat	High prevalence of prev "unknown causes of OA" with FAI (118/121), 70 FAI pts w/interval XR all with B findings, 73% progression of disease over time
Hartofilakidis et al.	JBJS Br	2011	96 (all FAI) 49 yrs	AP pelvis XR	17.7% progression of OA over 10y; presence of "idiopathic OA" on contralateral side was only predictor of progression
Nicholls et al.	Arthritis Rheumat	2011	1003 women 50 – 60 yrs Chingford study	AP pelvis	THA pts had a higher prevalence of cam deformity (a angle 62° vs 46°), a higher prevalence of DDH (LCE 30° vs 34°), median extrusion index 0.25 versus 0.185.
Reichenbach et al.	Arthritis Rheumat	2012	1080 (all M) 20 yrs Swiss cohort	MRI	Cam deformities were associated with labral lesions (OR 2.77), impingement pits (OR 2.9), and labral deformities (OR 2.45).
Agricola et al.	An rheum disease	2013 in pr.	1002 45 – 65 yrs CHECK cohort	AP pelvis, ROM and WOMAC	Severe cam-type deformity (OR 3.7 to 9.7) and reduced internal rotation are strongly predisposed to fast progression to end-stage OA.

FAI: Prevalence and association studies

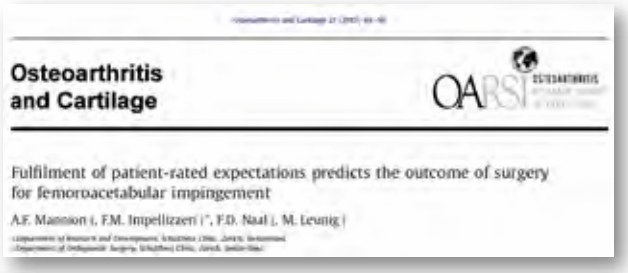
Cross-sectional studies:

- Cam FAI frequent in males (< 25%) but rare in females (< 5%)
- Pincer FAI in females (19%) and males (15%)
- Familial clustering of FAI (RR: 2 and 3)
- Impact (athletic) activies are associated with FAI

Longitudinal studies:

- Associations between FAI (cam >> pincer) and hip OA in most studies

Patient expectations: Reasons to undergo hip surgery



Osteoarthritis and Cartilage

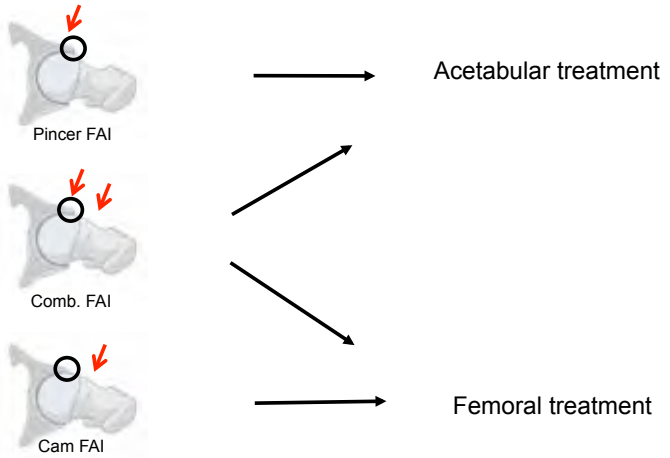
OARSI

Fulfilment of patient-rated expectations predicts the outcome of surgery for femoroacetabular impingement

A.F. Mannion †, F.M. Impellizzeri †*, F.D. Naul ‡, M. Leunig †

Results: The most frequent "top reason" for surgery was "alleviation of pain", being indicated by 33% patients; 20% patients chose "fear of worsening", 16% "improvement in everyday activities", 11% "other therapies failed", 10% "improvement in sporting activities" and 10% other. The 12-month data revealed prior expectations had been overly optimistic in more than 50% patients for hip pain, sport, and general physical capacity, and in 33–45% patients for independence, mental well-being, and walking capacity. Multiple regression revealed significant ($P < 0.05$) unique associations between GTO and "fulfilled expectations" for pain and sport (explaining 47% and 12% variance, respectively).

Principals of mechanical treatment



Outcomes of surgical treatment

Early outcomes: Open and arthroscopic “success” in 65%-96%

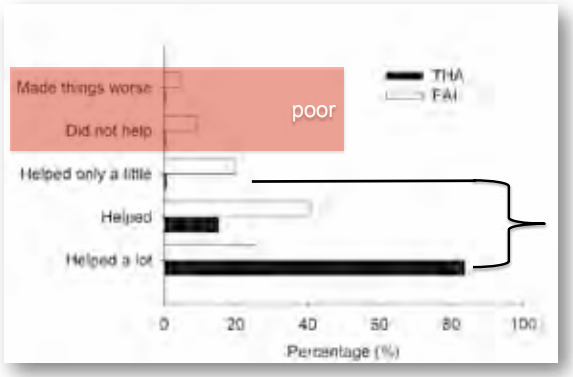
Failures found in older patients and increased OA

Long-term outcomes: No info available on OA progression

Distribution of outcome ratings

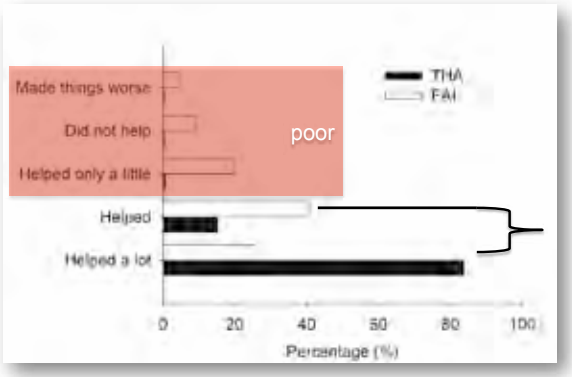
86% FAI success

Distribution of outcome ratings



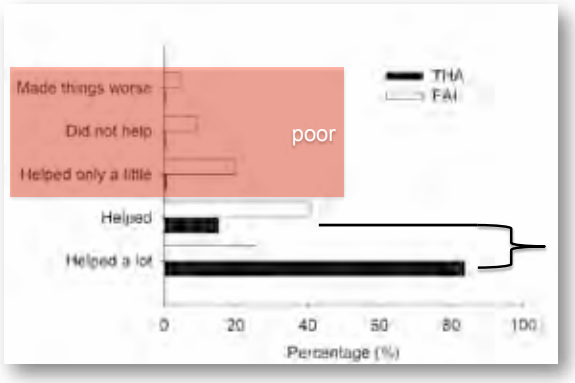
99% THA success

Distribution of outcome ratings



68% FAI good

Distribution of outcome ratings



99% THA good

Early outcomes: Pain and disability

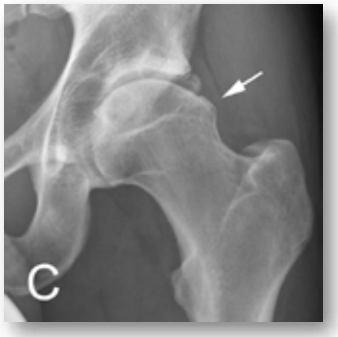

Osteoarthritis and Cartilage

The early outcome of surgical treatment for femoroacetabular impingement: success depends on how you measure it

F.M. Impellizzeri, A.F. Mannion, F.D. Naal, O. Hersche, M. Leunig

Conclusions: The results show that feeling better does not always equate to feeling good, and that improvements in outcome scores, even large, do not necessarily indicate acceptability of the current state. The cut-off values may help in the interpretation of trial results and individual change-scores recorded in clinical practice.

Long-term outcomes: Progression to OA



Can we influence the natural history?

FAI: Effect of surgical intervention

Requirements:	**FAI**
Controlled trials	✗
Long term studies	✗
Available:	
Case series	✓

Femoroacetabular impingement: An update

What do we know?

- Structural hip deformities (FAI) are frequent
- FAI deformities can cause pain and disability
- FAI deformities may lead to hip OA
- Surgery can decrease pain and improve function

What should you do in patients with hip related pain/disability?

- Correct clinical assessment and radiographic assessment
- Rule out other causes
- Treatment (conservative or surgical) depends on deformity, joint damage and compensatory problems

Thank you for your attention