Femoroacetabular Impingement: An update

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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.

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

= Pincer FAI
= Cam FAI
+ 

Overcoverage  Insufficient offset  Both

Concept of FAI: Complex interplay of plevic region

Current Concepts With Video Illustration: Static and Dynamic Mechanical Causes of Hip Pain

Asherik Bell, M.D., Mark Doham, M.D., Michael Zonig, M.D., and Bryan T. Kelly, M.D.

- Pincer FAI
- Cam FAI

Overcoverage  Insufficient offset  Both
**Epidemiology: Questions back in 2004**

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

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**Prevalence of cam FAI**

**Increase in females:**

10.4° (95% CI 9.5° to 11.2°)

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**Prevalence of FAI**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Journal</th>
<th>Year</th>
<th>No of pts/age</th>
<th>Imaging</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gosvig et al.</td>
<td>JBJS Am</td>
<td>2010</td>
<td>3620/60 yrs</td>
<td>Standing AP pelvis XR</td>
<td>19.5/6.2% prevalence of pistol grip, 15.5/10.4% deep socket, deformity not predictive for groin pain but deep socket and pistol grip are risk factors for development of OA (relative risk 2.4 and 2.2)</td>
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<tr>
<td>Hack et al.</td>
<td>JBJS Am</td>
<td>2010</td>
<td>200 (400 hips)</td>
<td>MRI radial slice</td>
<td>25% M and 5% F had cam FAI</td>
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<tr>
<td>Kang et al.</td>
<td>AJSM</td>
<td>2010</td>
<td>50 (100 hips)</td>
<td>CT</td>
<td>32% if 52% of M with at least one predisposing factor for FAI</td>
</tr>
<tr>
<td>Pollock et al.</td>
<td>JBJS Jr</td>
<td>2010</td>
<td>86 cases</td>
<td>Supine AP pelvis XR and cross-table lateral</td>
<td>2.8 RR of having cam deformity, 2.9 RR of pincer deformity, 2.6 RR of B deformity</td>
</tr>
<tr>
<td>Reichenbach et al.</td>
<td>ArthCare Res</td>
<td>2010</td>
<td>1180 (1180)</td>
<td>MRI</td>
<td>16% prevalence of cam deformity in young M, increases to 46% if decreased IR</td>
</tr>
<tr>
<td>Kapron et al.</td>
<td>JBJS Am</td>
<td>2011</td>
<td>67 (134 hips)</td>
<td>AP pelvis, frog lateral XR</td>
<td>Asymptomatic NCAA football players: 61% B head-neck offset failure, 61% crossover sign</td>
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</table>
## Association of FAI with OA

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</thead>
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<tr>
<td>Allen et al.</td>
<td>JBJS Br</td>
<td>2008</td>
<td>113 / 38 yrs</td>
<td>AP pelvis and</td>
<td>88 pts with cam but only 23/88 with B symptoms</td>
</tr>
<tr>
<td>Bardakos et al.</td>
<td>JBJS Br</td>
<td>2009</td>
<td>45 / 55 yrs</td>
<td>Supine AP pelvis</td>
<td>28403 with radiographic progression</td>
</tr>
<tr>
<td>Clohsey et al.</td>
<td>JBJS Am</td>
<td>2011</td>
<td>96 (710 hips), 118 FAI</td>
<td>AP pelvis and cross-table lat.</td>
<td>High prevalence of pre-surgical course of FAI with FAI (11.7%), 11 FAI pts underwent XR with b symptoms 27% progression of disease over time</td>
</tr>
<tr>
<td>Nicholas et al.</td>
<td>Arthros Rheum</td>
<td>2011</td>
<td>1053 women 50 – 60 yrs</td>
<td>AP pelvis</td>
<td>High prevalence of cam deformity in single A (25%) and higher prevalence of B (LCS 35 vs 34); median reduction index 0.25 mm versus 1.0.</td>
</tr>
<tr>
<td>Reichenbach et al.</td>
<td>Arthros Rheum</td>
<td>2012</td>
<td>1086 (all M) 20 yr, 50 yrs</td>
<td>MRI</td>
<td>Cam deformities were associated with tarsal index (2.77), and acetabular deformities (2.45).</td>
</tr>
<tr>
<td>Agricola et al.</td>
<td>Arthros Rheum</td>
<td>2013</td>
<td>1002 in 45 – 65 yrs</td>
<td>AP pelvic, ROM and WOMAC</td>
<td>Severe cam type deformity (OCR 3.7 vs 2.7) and reduced internal rotation were strongly associated in fast progression and end-stage OA.</td>
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## 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) activities are associated with FAI

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

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## Patient expectations: Reasons to undergo hip surgery

**Osteoarthritis and Cartilage**

> Fulfillment of patient-centered expectations predicts the outcome of surgery for femoroacetabular impingement.

**AF Masson, F. M. Impellizzeri, J. D. Stuﬁ, M. Lenzig**

**Results:** The most frequent "top reason" for surgery was "alleviation of pain," being indicated by 32% of patients; 20% of patients chose "feel of weakness," 16% "improvement in everyday activities," 11% "other therapies failed," 10% "improvement in sporting activities" and 10% other. The RF-12 study showed that 60% of patients had preoperative pain expectations had been met or exceeded. In more than 50% of patients for hip pain, sport, and general physical capacity, and in 33–43% patients for independence, mental well-being, and walking capacity. Multiple regression revealed significant (P < 0.05) unique associations between Q20 and "fulfilled expectations" for pain and sport explaining 47% and 12% variance, respectively.

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## Principals of mechanical treatment

- **Acetabular treatment**
  - Pincer FAI
  - Comb. FAI

- **Femoral treatment**
  - Cam FAI
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](image1.png)

86% FAI success

99% THA success

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


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 ✓
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