Acetabular cartilage delamination in femoroacetabular impingement: the under-diagnosis on MRA, risk factors and radiologic predictors

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Disclosures

• All authors have no financial conflicts to disclose
“From Hippocrates to present age, it is universally allowed that ulcerated cartilage is a troublesome thing & that once destroyed, is not repaired”

Hunter 1743
Reported Prevalence of cartilage delamination in patients with FAI

31.5% - 86.5%
Danish Hip Arthroscopy Registry: an epidemiologic and perioperative description of the first 2000 procedures

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- First 2000 procedures
- January 2012 through December 2014
- 56% females
- mean age 37.5 yo (9–80 )

- 13.9% isolated CAM
- 7.2% isolated pincer
- 72.4% mixed type FAI

Cartilage delamination 86.5%
Both cartilage delamination and labral lesions

MRA higher accuracy vs MRI
Reported sensitivity and specificity of MRA

- sensitivity → 22% - 97%
- specificity → 57% - 100%
What are the risk factors & radiologic predictors of CD in literature?
Acetabular Cartilage Delamination in Femoroacetabular Impingement
Risk Factors and Magnetic Resonance Imaging Diagnosis

By Lucas A. Anderson, PA-C, Christopher L. Peters, MD, Brandon B. Park, MD, Gregory J. Stoddard, MPH, Jill A. Erickson, PA-C, and Julia R. Crim, MD

Investigation performed at the Department of Orthopaedic Surgery, University of Utah, Salt Lake City, Utah

- Level III
- 62 patients / 64 hips
- Mean age 28yo
- Delamination presence 44%

- Results: Risk factors to CD
  pistol grip (OR = 11.9)
  Male gender (OR= 3.8)
  LCEA >40° (OR= 0.16)

- Results
  - Sensitivity 22.2%
  - Specificity 100%
  - Accuracy 55.6%
  - PPV 100%
  - NPV 65%
Relationship Between Offset Angle Alpha and Hip Chondral Injury in Femoroacetabular Impingement

Todd L. Johnston, M.D., Mara L. Schenker, B.S., Karen K. Briggs, M.P.H., and Marc J. Philippin, M.D.


- Level II
- 82 patients
- Mean age 25yo
- Mean a angle 53.9°
- Delamination presence 79%

a angle associated with:

- Full thickness delamination (P=0.034)
- Male gender (P=0.001)
The effect of joint space on midterm outcomes after arthroscopic hip surgery for femoroacetabular impingement.

Skendzel JG¹, Philippon MJ, Briggs KK, Golian P.

- 466 hip scopes / 63 with limited joint spaces
- Mean age 40.6 yo
- Mean f.u. 73 (60-97) months

THA more likely to older and female with higher a angle FAI
Objectives of Our Study

PRIMARY OBJECTIVE

• Measure the diagnostic value of MRA comparing the radiologist report to the intra-operative findings

SECONDARY OBJECTIVE

• Assess the potential risk factors and radiologic predictors
Methodology

DESIGN
• Single-centre cohort of 229 consecutive cases of hip arthroscopy for FAI
  - Males = 109, Females = 120

DATA COLLECTION
• Retrospective review
  - Clinical consultation notes
  - OR notes
  - MRA reports
• Prospective measurements
  - X-ray images
  - MRA images
  - Surgical videos

STATISTICAL ANALYSIS
• Sens, Spec, PPV, NPV
• Descriptive statistics
  - Continuous variables: means, std devs
  - Binary variables: frequencies, percentages
• Logistic regression models
  - Crude and adjusted ORs
  - P-values

*Note: Significance Level of \( \alpha = 0.5 \)
Variables
Check for Associations Between Cartilage Delamination and:

DEMOGRAPHICS:
- Gender
- Side
- Age
- BMI

CLINICAL CHARACTERISTICS:
- Duration of symptoms before sx
- CAM, pincher or both
- Osteoarthritis
- The grade of OA
- The size of the labrum
- Location and size of delamination
- Lateral centre-edge angle
- Acetabular index
- Posterior wall deficiency
- Acetabular retroversion
- Anterior or lateral osseous bump
- Alpha angle in frog view
- Alpha angle in AP view
- Pistol grip deformity
- Cyst in Acetabulum
- Impingement cysts
- Size of joint space
- Cyst presentation on x-rays vs MRA
- Coexistence of labral tear
- Labral Tear Size and location
### Our Population

- 100% had labral tears
- X-ray cysts measured in 38.4%

**Table: Delamination Present vs. Absent**

<table>
<thead>
<tr>
<th></th>
<th>Delamination Present (Cases)</th>
<th>Delamination Absent (Controls)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Males (n=87)</td>
<td>Females (n=82)</td>
</tr>
<tr>
<td>Age at Time of Sx (yr)</td>
<td>38.9±12.5</td>
<td>39.9±13.7</td>
</tr>
<tr>
<td>Time from MRA/I to Sx (mth)</td>
<td>9.5±7.2</td>
<td>11.5±8.9</td>
</tr>
<tr>
<td>LCEA AP X-ray (deg)</td>
<td>35.0±7.9</td>
<td>32.4±8.2</td>
</tr>
<tr>
<td>α-angle Frog-Leg X-ray (deg)</td>
<td>52.9±14.8</td>
<td>44.8±13.8</td>
</tr>
<tr>
<td>α-angle AP X-ray (deg)</td>
<td>55.9±19.0</td>
<td>51.0±19.0</td>
</tr>
<tr>
<td>Joint Space Size (mm)</td>
<td>4.6±1.0</td>
<td>4.2±1.1</td>
</tr>
</tbody>
</table>
Video OR Results

- At surgery time delamination presence → 73.8%
- Mean size of delamination → 3 cm²
- Location of delamination → 2.6 - 11.87 o’clock position
- 54% lesion type III and IV (Conan classification)

Sagittal length: 4.33 cm
Coronal width: 0.68 cm
Type IV
Type III
MRA Results

OR Report

+ -
8 3
- 77 165

- Sensitivity: 9.4%
- Specificity: 98.2%
- NPV: 68.18%
- PPV: 72.7%

Accuracy: 68.4%
Results - Risk factors

- Female gender ($p=0.05$)
- Age of patient ($p=0.002$, OR=1.04)
- CAM FAI type ($p=0.032$, OR=2.3)
Results - Radiologic Predictors

- Pistol grip deformity (p=0.03, OR=2.3)
- Anterior or lateral bony bump (p=0.0009, OR=2.8)
- $\alpha$ -angle in frog leg view (p=0.0023, OR=1.0)
- $\alpha$ -angle in AP view (p=0.0134, OR=1.02)
- Coronal labral diameter on MRA (p=0.04, OR=1.27)

mean 5.78mm
Results - Radiologic predictors

- There was a negative association between the CD and the pincer deformity
- LCEA (p=0.07)

Measured from the sclerotic lateral sourcil edge
Conclusions

• Is a very common pathology: 73.8%

• Severely under-diagnosed with MRA sensitivity: 9.4% and accuracy: 68.4%

• Suspect older females with CAM FAI and large labrum on MRA
Literature


