The Effect of Cam Impingement on Severity of Synovitis: A Multi-center descriptive study

D CARREIRA 1, D. MATSUDA 2, B. KIVLAN 3, S. NHO 4, A. WOLFF 5, J. SALVO 6, J. CHRISTOFORETTI 7,8, T. ELLIS 9, T. UELAND 1

1 Peachtree Orthopedics, Atlanta, GA; 2 DISC Sports and Spine Center, Marina del Rey, CA; 3 Duquesne University, Pittsburgh, PA; 4 Rush University Medical Center, Chicago, IL; 5 Washington Orthopaedics and Sports Medicine, Washington D.C.; 6 Rothman Orthopedic Institute, Marlton, NJ; 7 Texas Health Sports Medicine, Allen, TX; 8 Allegheny Health Network, Pittsburgh, PA; 9 Orthopedic One, Dublin, OH
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- **AW**
  - Consultant: Stryker, AlloSource

- **TE:**
  - Consultant for Stryker and Pivot Medical
Cam-type femoroacetabular impingement (FAI) has become increasingly recognized as a contributor to intra-articular pathology and progression to osteoarthritis (OA)\(^1,2\).

Anteroposterior (AP) radiographs provide adequate visualization of many cam impingements with the alpha angle measurement, where >55° indicates a cam deformity.

Inflammation of the joint synovial lining is a common finding in hip arthroscopy. Investigations of degeneration in other joints suggest a significant role for synovial pathology in OA progression\(^3-6\).
Introduction

• However, the effect of synovitis independent from concomitant intra-articular pathologies remains largely unknown.
  • While labral tearing and articular cartilage damage may be identified in a pre-operative MRI, detection of synovitis in the hip typically requires gadolinium-enhanced MRI or ultrasound.7

• The goal of this study was to examine whether the extent of pre-operative cam deformities could bring predictive utility of intra-operative synovitis severity in hip preservation surgery.
Introduction: Synovitis in the Literature

• Synovitis and Progression to OA

MOST Cohort

Synovitis significantly associated with incident radiographic OA even after controlling for the effect of co-existing pathologies (239 OA, 731 control knees)³.

In non-OA knees, effusion synovitis brought greater risk for cartilage loss 30 months later, independent from other effects on cartilage degeneration and inflammation (514 knees without OA)⁶.

OA Initiative

Evidence of effusion synovitis 1 year prior to OA confirmation: strong predictor of OA onset (133 OA knees, 133 control knees)⁴.

Another study of similar design found synovitis brought heightened risk two years prior to radiographic OA (355 OA knees, 355 control knees)⁵.

Synovitis with OA

After a diagnosis of OA, synovitis may further worsen symptoms and course. Increased synovitis on MRI 2 years after OA associated with accelerated progression and cartilage deterioration (n=39)⁸.
De-identified data from 3162 patients between January 1, 2015 and March 1, 2018 at 10 hip arthroscopy centers nationwide. Each surgeon has performed >100 hip arthroscopy cases per year for at least 8 years.

Alpha angles were recorded from pre-operative AP and lateral radiographs and compared with intra-operative synovitis findings (ANOVA, Tukey’s post hoc) with an a priori p<0.05.

**Inclusion criteria**: isolated hip arthroscopy procedure, documented alpha angle, documented intra-operative synovial pathology

**Exclusion criteria**: ineligibility for hip arthroscopy, including patients with osteoarthritis, septic arthritis, or previous hip arthroplasty
Materials and Methods

Synovitis Classification Scheme

- **Grade 0**: no evidence of erythema or hypertrophy of the synovial membrane and absence of villi

- **Grade I**: some erythema or hypertrophy of the synovial membrane and low density villi

- **Grade II**: severe erythema that is contained or patchy and moderate presence of villi

- **Grade III**: diffuse erythema and hypertrophy throughout the membrane as well as high density
Results

- No significant differences were observed in demographic factors between the synovitis groups.
- For each synovitis group, alpha angles scaled positively with severity of synovitis and significant differences were observed across all groups.
  - Grade 0: 57° ± 12
  - Grade 1: 59° ± 13
  - Grade 2: 61° ± 14
  - Grade 3: 66° ± 14

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Mean ± SD</th>
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<tbody>
<tr>
<td>N</td>
<td>3162</td>
</tr>
<tr>
<td>Gender (M,F)</td>
<td>1138, 2024</td>
</tr>
<tr>
<td>Age</td>
<td>34.1 ± 11.3</td>
</tr>
<tr>
<td>BMI</td>
<td>25.2 ± 3.6</td>
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</tbody>
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Results

**Alpha Angle vs. Synovitis Severity**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Alpha Angle (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>55</td>
</tr>
<tr>
<td>Grade 1</td>
<td>60</td>
</tr>
<tr>
<td>Grade 2</td>
<td>65</td>
</tr>
<tr>
<td>Grade 3</td>
<td>70</td>
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</tbody>
</table>

* p<0.05
Conclusions

- Radiographic evidence of a cam lesion warrants expectation of synovitis during hip arthroscopy.
- The severity of cam lesion scales positively with the severity of observed synovitis. The progression from cam lesion to chondrolabral pathology is well studied, but a similar progression with synovial pathology is worth further exploration.
- Additional studies are needed to investigate relationships between synovitis and parameters of pincer impingement and dysplasia (lateral center edge angle, anterior center edge angle, Tonnis angle).


