FAI (FemoroAcetabular Impingement)

I: Epidemiologic study associated with Sport injury
II: Contributing to progression of hip OA

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Introduction

- FAI is considered to be a pre-arthritic condition
  \[\text{Ganz R Clin Orthop Relat Res. 2003}\]
  \[\text{Tanzer M Clin Orthop Relat Res 2004}\]
- Prevalence of FAI as a clinical diagnosis is estimated to be 10% in a general adult population
  \[\text{Tanzer M Clin Orthop Relat Res 2004}\]
- Athletes have been more often associated with FAI than ordinary patients

Purpose of this study

- There has been increased reports evaluating the relationship between sports activity and prevalence of FAI

  1. To determine the prevalence of symptomatic FAI in athletic patients
  2. To find out the most common type of sport in Korea

Material & Methods

- 422 hips (388 patients) of FAI
  - Retrospective study
  - July, 2003 ~ May, 2013 (10 yrs)
  - All cases were done arthroscopic Tx due to FAI Sx by one surgeon (DS Hwang)

- Inclusion criteria
  - Associated sports as we defined who underwent arthroscopic surgery due to FAI

- Exclusion
  - Insufficient radiographs or records
  - High energy hip trauma
  - Previous hip surgery
  - Tönnis Grade 2 or above
  - Proliferative disease of hip
  - LCPD
  - DDH etc
60 hips in 50 patients were excluded

Mean age at surgery: 37.3 yrs (16~70 yrs)

362 Hips (338 patients)

M : F = 229 : 109

Material & Methods

- History of sport activity
  - Duration of exercise: at least, more than 2 hour/day, more than 3 times/week, more than 1 year
  - % associated with sport activity
  - Incidence at Age/Sex
  - Prevalence & Type of most common sport activity at ages
  - Type of FAI (Mixed, Cam, Pincer)

Material & Methods

- Radiologic evaluation of FAI
  - Alpha angle
  - Head neck offset
  - Cross over sign (figure of 8 sign)
  - Coxa profunda, acetabular protrusio
  - 3D-CT
  - Geographic bony deformity
  - MRA, if needed
    - Assessment of cartilage, labrum, synovium, cyst

Results

Incidence at Age, Sex & Type of FAI

- Most common at ages 20s, 40s
- Male is most common at 20s, relatively more at 40s
- Cam type > Mixed > Pincer

<table>
<thead>
<tr>
<th>Type</th>
<th>20s</th>
<th>40s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Cam</td>
<td>57</td>
<td>1st Cam 37</td>
</tr>
<tr>
<td>2nd Mixed</td>
<td>33</td>
<td>2nd Mixed 24</td>
</tr>
<tr>
<td>3rd Pincer</td>
<td>12</td>
<td>3rd Pincer 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>20s</th>
<th>40s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>86</td>
<td>84.31%</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>15.69%</td>
</tr>
</tbody>
</table>

Results

- Epidemiology of FAI
  - 43.1% associate with sport activity
  - Most common type of sport activity: Soccer, Taekwondo, Baseball

Results

Prevalence & Type of sport activity at ages

- Teenage
  - Martial arts 10s
  - Soccer, Taekwondo 20s
  - Variable activity 40s

- Under 20s: More associated with sport activity
26/M FAI (Mixed)
- Taekwondo for 15yrs
- Body builder trainer

Postop. Smile

40/F(pincer type), yoga for 3 yrs

Discussion
- FAI induces cartilage or acetabular labrum lesion, and ultimately could result in degenerative arthritis
  Ganz R Clin Orthop Relat Res 2003
  Tanzer M Clin Orthop Relat Res 2004
- Early diagnosis and treatments of FAI can prevent progression of hip joint arthritis
  Ganz R Clin Orthop Relat Res 2003
- High intensity of sports activity during adolescence is associated with increase in the risk of cam-type FAI
  Sidenvann KA Clin Orthop Relat Res 2011
Discussion

- 93% of returning rate of 45 professional athletes after treatments with arthroscopic surgery

- Professional athletes and would-be professionals with hip pain should undergo screening tests for FAI and ALT

Limitation

- Retrospective Study

- Patient bias due to geographical or institutional predominance

FAI:

Part II. Contributing to progression of hip OA

Conclusion

- FAI usually occurs in young adults and is highly related to sports activity

- Most type related to sports was cam type

- Soccer and Martial arts were the most common cause of it.

Screening test for FAI in young sports players is necessary at the beginning of the sports

Introduction

- Utilization rates of THA have been increasing in most western and Asian countries including Korea

- OA was the most common underlying condition for THA in western countries

Published in 2016, Hip & pelvis

FAI: Contributing to progression of hip OA

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Introduction

Mechanical causes of OA

- Previously, Increased local contact stress in incongruent joint
- Recently, FAI in extreme joint motion has come into spotlight as the cause of OA

Causes of OA leading to THA

Primary OA - still unknown
- FAI (bony deformity) in young active ages?
- Idiopathic early OA in middle ages

Secondary OA
- Pediatric Hip sequelae (DDH, Coxa vara, LCP, SCFE)
- Traumatic
- AVN
- Extraplural DISH
- Inflammatory arthritis (Peripheral type of AS, RA)
- Others

Introduction

Secondary OA such as dysplasia could easily change to moderate/severe OA

It is still unknown how many FAI could induce moderate/severe OA

We investigated epidemiologic study to find out

Can FAI Cause Severe Osteoarthritis that Results in Total Hip Arthroplasty?

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Purpose of this study

1. To analyze Causes leading to THA
2. To clarify the Prevalence of FAI among the causes
3. To compare the Prevalence in Korea with other countries

Material & Methods

- Patient selection
  - From 2000 to 2014
  - Patients who underwent primary THA were reviewed by two surgeons
  - Patients were categorized causes leading to THA into
    - Primary OA
    - Rheumatoid arthritis (RA)
    - Posttraumatic arthritis
    - Postinfectious arthritis
    - AVN of femoral head
    - Fracture of femoral head or neck
    - Ankylosing spondylitis (AS)
    - Developmental dysplasia of the hip (DDH)
    - Legg-Calvé-Perthes disease (LCPD)
    - Femoracetabular impingement (FAI)
    - Others
We excluded one by one to find out FAI

- Rheumatoid arthritis
- Trauma
- Postinfectious arthritis
- AVN of femoral head
- Ankylosing spondylitis
- DISH
- Axial and pelvic arthropathies
- Developmental dysplasia of the hip
- Slipped capital epiphysis
- Legg-Calvé-Perthes disease
- Acetabular impingement
- Synovial disease (PVNS, Synovial chondromatosis)
- Others

Material & Methods

Patient selection
- FAI group was subcategorized into Cam, Pincer and Mixed type
  - Cam type: Alpha angle > 50°, ant. Femoral offset < 8 mm, pistol grip
  - Pincer type: acetabular abnormality (retroversion, coxa profunda, acetabular protrusion)
  - Mixed type
- Primary OA
  - Unknown underlying causes
  - Centre-edge angle > 25°, sharp angle < 45° and acetabular roof obliquity < 15°

Results

1206 hips of 818 patients (477 males, 341 females)

Number of case underwent THA had increased constantly since 2000

<table>
<thead>
<tr>
<th>Cause</th>
<th>No. patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary osteoarthritis</td>
<td>32 (3.91%)</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>41 (5.01%)</td>
</tr>
<tr>
<td>Posttraumatic arthritis</td>
<td>84 (10.27%)</td>
</tr>
<tr>
<td>Postinfection arthritis</td>
<td>39 (4.77%)</td>
</tr>
<tr>
<td>Avascular necrosis of femoral head</td>
<td>36 (4.42%)</td>
</tr>
<tr>
<td>Fracture of femoral head or neck</td>
<td>36 (4.77%)</td>
</tr>
<tr>
<td>Ankylosing spondylitis</td>
<td>21 (2.57%)</td>
</tr>
<tr>
<td>Developmental dysplasia of the hip</td>
<td>32 (3.93%)</td>
</tr>
<tr>
<td>Legg-Calvé-Perthes disease</td>
<td>71 (8.68%)</td>
</tr>
<tr>
<td>Femoroacetabular impingement</td>
<td>52 (6.36%)</td>
</tr>
<tr>
<td>Cam type</td>
<td>36 (46.03% of FAI group)</td>
</tr>
<tr>
<td>Pincer type</td>
<td>15 (18.70% of FAI group)</td>
</tr>
<tr>
<td>Mixed type</td>
<td>1 (1.25% of FAI group)</td>
</tr>
<tr>
<td>Others</td>
<td>22 (2.69%)</td>
</tr>
<tr>
<td>Total</td>
<td>818</td>
</tr>
</tbody>
</table>

Results

Primary OA
- Among 818, 32 patients (3.91%)
  - 13 males, 19 females
  - Mean age 67.77 years old (range, 52-80)

FAI
- Among 818, 52 patients (6.36%)
  - 13 males, 36 females
  - Mean age 73.02 years old (range, 41-90)

Cam type
- Among 52, 15 patients (28.85%)
  - 3 males, 12 females
  - Mean age 72.67 years old (range, 62-86)

Pincer type
- Among 52, 15 patients (28.85%)
  - 3 males, 12 females
  - Mean age 72.67 years old (range, 62-86)

Mixed type
- Among 52, 1 patient (1.92%)
  - 1 male
  - 41 years old
Case I
- Cam type FAI
- 85 years old female
- Typical pistol grip deformity

Case II
- Pincer type FAI
- 76 years old female
- Typical acetabular protrusion

Case III
- Primary OA
  - 62 years old female
  - 67/F
  - Rt.
  - Lt.
  - CE angle
<table>
<thead>
<tr>
<th></th>
<th>Rt.</th>
<th>Lt.</th>
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<tbody>
<tr>
<td></td>
<td>37.2°</td>
<td>43.5°</td>
</tr>
<tr>
<td>Sharp angle</td>
<td>35.8°</td>
<td>35.2°</td>
</tr>
<tr>
<td>Acetabular roof obliquity</td>
<td>8.6°</td>
<td>7.0°</td>
</tr>
</tbody>
</table>

Discussion
- Most cases of primary OA of the hip had mild dysplasia and/or pistol-grip deformity, so that primary OA was extremely rare
  - Harris et al. CORR 1996

- Etiology of the OA in 125 patients among 200 consecutive patients undergoing THA was idiopathic arthritis, but all 125 patients had a pistol-grip deformity
  - Tanzer et al. CORR 2004

Discussion
- Primary hip OA is commonly believed to account for the majority of all hip OA in western societies
  - Hartofilakidis et al. Orthopedics 2003

- Primary OA accounted for only 18% of THA in Korea
- Most common indication for primary THA in Korea was AVN
- These results were a little bit similar to our result
  - AVN : 44.62%
  - Posttraumatic OA 10.27%
  - etc

- In our data, FAI is 52 (6.36%), Dysplasia is 52 (6.36%) & primary OA is 32 (3.91%),
**Discussion**

- Rate of FAI in Korea (6.36%) was higher than in Japan (0.6%).
  - Different lifestyle may increase the impingement
  - Squatting and crossed-legged sitting (tailor sitting) on floor were more common to life in Korea.
- Recently, FAI can be more detectable because of having more precise information about FAI.

**Limitation**

- Patient bias due to geographical or institutional predominance
  - This epidemiological results may be influenced by these errors
- Not multi-center study
  - Size of study was small as a cohort study

**Conclusion**

- Most common causes of severe OA leading to THA is AVN of the hip in Korea.
- FAI usually lead to early OA & could be lead to moderate to severe OA of the hip.
- However, OA resulting from FAI need more times to become severe OA comparing with other causes which was confirmed by our data that the patients with severe secondary OA resulting from FAI are older ages than other causes.