Beyond Conventional FAI: Extra-Articular Hip Impingement

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Disclosures

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FAI CAM Impingement
Extra-Articular Impingement

1. Subspine Impingement 2. Ischiofemoral Impingement 3. Trochanteric Pelvic Impingement
**Subspine Impingement**

- Direct impingement of the inferior neck of the femur against the AIIS with straight hip flexion.
- This contact may result in clinical symptoms of hip flexor pain.

**Subspine Impingement**

- Variation of pincer impingement: abnormal bony anatomy of AIIS → impingement → damage to soft tissues overlying AIIS.
Review of 60 patient CT scans with independent rating by three reviewers of the AIIS morphology utilizing four views to define the shape of the AIIS and its relation to the acetabular rim.

### Variations in AIIS Morphology

<table>
<thead>
<tr>
<th>Type and Sub-Type</th>
<th>Description</th>
<th>CT Definition</th>
<th>Clinical Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Upsloping</td>
<td>Upsloping on Ischium View</td>
<td>AIIS does not contribute to impingement</td>
</tr>
<tr>
<td>II</td>
<td>Flat</td>
<td>Flat on Ischium View</td>
<td>AIIS may contribute to impingement</td>
</tr>
<tr>
<td>III</td>
<td>Downsloping</td>
<td>Downsloping and crosses the rim</td>
<td>AIIS may contribute to impingement</td>
</tr>
</tbody>
</table>
Indications for Surgery with SSI

- Pain with terminal hip flexion
- TTP AIIS
- Type 2 or 3 AIS on imaging
- Erythema / Inflammation of tissue overlying AIS during diagnostic arthroscopy

Table 6: Indications for Surgery with SSI

<table>
<thead>
<tr>
<th>Indications</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Pain with terminal hip flexion</td>
<td>Proximal fracture of the femur and extensive subluxation of the AIS, imaging showing Type 1 AIS, concomitant hip flexion and observable joint space of the AIS</td>
</tr>
<tr>
<td>TTP AIIS</td>
<td>Anterior hip pain, subluxation of the AIS, limited or painful second flexion of the femur</td>
</tr>
<tr>
<td>Type 2 or 3 AIS on imaging</td>
<td>Erythema and inflammation of tissue overlying AIS</td>
</tr>
<tr>
<td>Erythema / Inflammation of tissue overlying AIS</td>
<td>Increased pain with terminal hip flexion, prominent AIS on imaging</td>
</tr>
<tr>
<td>Type 1 AIS</td>
<td>Proximal fracture of the femur, subluxation of the AIS, limited or painful second flexion of the femur</td>
</tr>
</tbody>
</table>

Note: Images and diagrams are not included in this text representation.
**Intraoperative SS Decompression**

**Pre-Resection**

**Post-Resection**

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**Preoperative X-ray**

**S/P AIIS decompression**

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**SSI Clinical Outcomes**

*7 Studies, all level 4/5*

*Conclusions: Safe and Effective procedure, More clinical studies warranted*
Extra-Articular Impingement

1. Subspine Impingement
2. Ischiofemoral Impingement
3. Trochanteric Pelvic Impingement

Ischiofemoral Impingement

- Decreased space/impingement between lesser trochanter and ischium
- Atypical groin / posterior buttock pain
- Edema within QF and secondary inflammation of sciatic nerve → possible “sciatica” type radiating pain
IFI - MRI

IFI Treatment

- Activity Modification
- Gait training and PT = prevent excessive extension/ER
- Injection IF space
- Surgical decompression: endoscopic vs open
  - Case reports only
  - Risks
    - Subtroch fracture
    - Sciatic nerve injury
    - AVN femoral head (MPCA)

Endoscopic IF Decompression
Postoperative Radiographic Assessment

OutcomesIFI

- Level 4 and 5 studies only
- Small series and case reports of Open and Endoscopic decompression, but no high level evidence or long term outcomes available

Extra-Articular Impingement

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Extra-Articular Impingement

1. Subspine Impingement
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Trochanteric Pelvic Impingement

- Greater trochanteric impingement against the ilium in certain morphologic variants/positions.
- This can lead to pain and disability in the hip region that is NOT relieved by intra-articular injection.
Common pediatric hip deformities may result in trochanteric pelvic impingement.

- SCFE
- Perthes Deformity
- Trochanteric Pelvic Impingement

Post-Traumatic or Iatrogenic Deformities

TPI – Examination
TPI - Treatment

- Activity Modification
- PT
- Injections
- Surgical intervention
  - Endoscopic excision anterior greater trochanter
  - Open Greater Trochanteric Reduction Osteotomy

Role of Endoscopy in TPI

Limited, but has been described in subtle cases…
Arthroscopic decompression of Anterior facet:
“Virtual Relative Neck Lengthening”

TPI Outcomes

Table 4. Study Demographic Data for TPI Literature Review

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Follow-up</th>
<th>Indications</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith et al (2001)</td>
<td>Case series</td>
<td>11/2/11 (100%)</td>
<td>Initial surgical treatment only to higher level of surgical care</td>
<td>Good results</td>
</tr>
<tr>
<td>Meller et al (2004)</td>
<td>Case series</td>
<td>12/15 (80%)</td>
<td>Open anterior facet decompression, 2 hips, 20% improved, 2 hips, no change</td>
<td>Good results</td>
</tr>
</tbody>
</table>

2 Largest case series = Open Reduction Osteotomies ➔ Good results
Conclusions:
Endoscopy may have a role for extra-articular disease...

1. Subspine Impingement
2. Trochanteric Hip Impingement
3. Ischiofemoral Impingement

BUT WE HAVE TO BE CAREFUL ABOUT GOING TOO FAR!!

Thank You
IF Imping

- First described Dr. Johnson 1977
- In THA w/persistent posterior pain

Surgical Pearls and Pitfalls

- Preoperative planning
  - Avoid overlooking a hip dysplasia, commonly seen in these patients.
  - Strongly consider using 3D CT reconstruction views to assess the extension of the AHS retroversion, both digitally and manually.

- During surgery
  - A flexible radiofrequency probe may be helpful to dissect the capsule around the AIS.
  - Avoid traction beyond 50 mm to decrease risk of fracture, knowing that traction is not necessary to proceed with AHS decompression.
  - Fluoroscopic images are helpful to confirm adequate AHS decompression.
  - Avoid over-resection proximally to ensure not to jeopardize the minor femoral attachment.

- Monitor the patient’s temperature and abdominal pressure to avoid overloading intra-abdominal structures of fluids (at this time, this is a theoretic complication that was not seen in any of our patients).

- After completion of the AHS decompression, measure labral attachment integrity. In some cases, when the AHS prominence extends straight distally to the rim level, the labrum may need repair in the completion of the decompression.

The Crossover Sign Overestimates Acetabular Retroversion

- 38 well-positioned AP pelvis radiographs with a positive cross-over sign
- Only 19/38 with focal or global acetabular retroversion on CT scan
- AHS and subspine impingement may be partially or completely responsible for crossover sign appearance in all cases with an anteverted acetabulum
Sub-spine impingement is a variation of traditional cam / pincer impingement. 

On clinical exam provocative pain testing is greatest with straight hip flexion. 

Patients with downsloping or hooked AIIS morphology, or those with extension to or beyond the acetabular rim are at greatest risk. 

Arthroscopic decompression of the prominent AIIS may provide symptom relief and increased ROM. 

Future clinical studies necessary.

SSI Conclus

Case series of ten patients who underwent arthroscopic treatment for sub-spine impingement 

All patients had Type II or Type III AIIS morphologies 

Improvement in hip flexion from 99±7° to 117±8° 

mHHS improvement from 64±18° pre-op to 98±2° 

Problem: All had concomitant FAI procedures

Clinical Outcomes – SS Decompression
Post-op Rehabilitation

- Proceed with active ROM
- Weight bearing protected 2 weeks
- Particular emphasis on restoring 3K
  - Hip extension should be good at 17-18 weeks
  - 10-degree Trendelenburg is OK at 12 weeks
- May also consider some isometric strengthening
- Referrals seen at 6 weeks for clinical and radiographic follow-up
- Non-union does not occur in the 2-3% range patient society for athletic sports
Subspine Impingement

- Direct impingement of the inferior neck of the femur against the AIS may occur with straight hip flexion.

- This contact may result in clinical symptoms of hip flexor pain.

Subspine Impingement

- Abnormal contact between the inferior femoral neck and the AIS during straight flexion due to AIS morphology.

Subspine Impingement

- Abnormal contact between the inferior femoral neck and the AIS during straight flexion due to AIS morphology.
GTPI

Table 10: Clinical Outcomes and Complications From Surgical Management of GTPI

<table>
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<tr>
<th>Case</th>
<th>Surgical/Orientation</th>
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<tbody>
<tr>
<td>Gross et al. (2011)</td>
<td>All outcomes noted in 6 mos, with 11 revision cases at a minimum 5 yr follow-up.</td>
</tr>
<tr>
<td>Panam et al. (2013)</td>
<td>All patients reported subjective improvement.</td>
</tr>
</tbody>
</table>

Without bone-bone contact, soft tissue impingement source of ant hip pain:
- Labrum
- Capsule
- Indirect rectus

Determine maximal flexion and space available for soft tissue in 3 AIIS subtypes cadaveric study

Biomechanical Study

- Without bone-bone contact, soft tissue impingement source of ant hip pain
- Labrum
- Capsule
- Indirect rectus
- Determine maximal flexion and space available for soft tissue in 3 AIIS subtypes cadaveric study
Results

- The space available for soft tissue ~50% less in the type II group versus type I
- Type III significantly reduced ROM in straight flexion (avg 10 degrees less than type I and II) due to direct contact against the neck.

Profile

- F>M
- Wide age range
- U/l > B/l (24-40%)
- Posterior hip pain

Clinical Presentation

- Hip pain: Anterior, groin, or posterior
- Mech sxs
- Neurologic sxs
- Gait abnormality: hip extension phase
- XR narrowing of space b/w LT and ilium
- Annormal MRI signal of quadratus femoris
Why are apparent #s increasing

- Improved recognition by MDs
- Better educated patient population
- MRI
- Analysis of Failures

IF Space Anatomy

- Pull up pics from Hal Martin studies
- Sciatic nerve close
• Hx
• PE
• Imaging
• Setting Expectations

Clinical Eval

• Hx
• PE
• Plain XR
• MRI
• IF space injection

PE

• SYMMETRY!
• Always compare both sides!
• Neg classic impingement test, symmetric joint ROM, and still having pain