Disclosures

- Arthrex, Inc
  - Paid consultant, royalty
- Breg, Inc
  - Paid consultant, royalty
- Employed physician
  - Allegheny Health Network

The $100,000,000 Questions?

- What is wrong with my hip?
- Can you fix my hip so I can play sports again?
- What can I do:
  - To exercise?
  - To prepare for sports?
  - To LIVE the way I want?
- Should I invest in this athlete?
  - Scholarship?
  - Contract?
Classification of Athletic Hip Injury

- By damaged tissue
  - Intraarticular versus Extraarticular
  - Abdominal versus Hip Joint versus Periarticular
- By symptom onset
  - Acute versus Chronic
- By injury mechanism
  - Traumatic versus Atraumatic (overuse)
- Combination of factors common

Conceptual Understanding of Athletic Hip Injury

- Functional Demand
- Mechanical Structure
- Genetic/Biomaterial

Practical Implications: A, B, C's

- Understand A:
  - training and competitive demands of specific sport activity for specific patients
- Understand B:
  - the available skeletal functional range of motion
- Understand C:
  - that athletes will achieve A despite B at the expense of terminal bone/soft tissue/chondral structures
Parallel Diagnostic Pathways

Search for Pain Generator Today

- Physical exam elements
  - Passive ROM/ tenderness on palpation/ inspection for deformity
- Imaging elements
  - Plain radiographs (early and appropriately)
  - MRI or MRA (appropriately and sometimes early)

Search for Conflict in A,B,C’s that lead to today and will shape tomorrow!

- Physical Exam Elements
  - Sports training regimen and performance mechanics
  - General laxity exam
  - Impingement exams
- Imaging Elements:
  - Specialized and standard plain xrays
  - MRI/MRA
  - CT scan

Search for Conflict in A,B,C’s that lead to today and will shape tomorrow!
Radiographs:

- **Standard Series**
  - AP Pelvis
    - Centered at symphysis pubis
  - Dunn/Cross Table or Frog Lateral

- **Special Views**
  - False Profile
    - Anterior wall coverage
  - Weight Bearing views

**Severe Arthritis: Tonnis 3**
Normal: Tonnis 0

Mild Arthritis: Tonnis 1

Moderate Arthritis: Tonnis 2
Why order an MRI Scan?

- Rules OUT pathology
  - Stress fracture
  - Neoplasia
  - Effusion
  - Myotendinous injury
  - Pelvic or abdominal visceral injury

- Arthrogram
  - Historically used for detection of labrum tears
  - IS SUPERIOR to non-arthrogram at identifying chondral surface injury
  - False positive and false negative rates 1-2% are likely underestimated

MRI Diagnosis: Stress fracture

MRI diagnosis: Avascular necrosis
Deciding for MRI/MRA: (most important in revision cases)

**Functional Understanding of Hip**

**Anterior Athletic Hip Pain**

<table>
<thead>
<tr>
<th>Loose Hip</th>
<th>Tight Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Increased ROTATORY motion at 90 degrees flexion</td>
<td>□ Decreased rotatory motion at 90 degrees flexion</td>
</tr>
<tr>
<td>□ Frequent alternate joint laxity</td>
<td>□ May have muscular stiffness as well, but not always</td>
</tr>
<tr>
<td>□ Female gender</td>
<td>□ Multiple aches/soreness in lumbar spine/pubic bone due to compensatory motion and often degenerative changes</td>
</tr>
<tr>
<td>□ Snaps, pops, clicks</td>
<td>□ May complain of feeling stiff or tight with findings above</td>
</tr>
<tr>
<td>□ Psoas and other lateral achy pain common as muscles work to dynamically stabilize the joint!</td>
<td></td>
</tr>
</tbody>
</table>

**Internal Snapping Hip**

<table>
<thead>
<tr>
<th>Loose Hip</th>
<th>Tight Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Snap of tendons crossing the joint capsule</td>
<td></td>
</tr>
<tr>
<td>□ Typically the iliopsoas muscle crossing at the anterior pubic bone</td>
<td></td>
</tr>
<tr>
<td>□ RARELY can bruise labrum below iliopsoas bursa (iliopsoas impingement)</td>
<td></td>
</tr>
<tr>
<td>□ Described by Domb, Kelly</td>
<td></td>
</tr>
<tr>
<td>□ Occurs when patient moves from flexion abduction external rotation to extension internal rotation</td>
<td></td>
</tr>
<tr>
<td>□ 30-40% of hips will experience this on occasion</td>
<td></td>
</tr>
</tbody>
</table>
ABC's: Snapping hip and CIFI

- Sport demands generate force that exceeds inherent concentric reduction of hip joint
- Muscles and lumbopelvic bones MUST dynamically realign to generate macro-stability
- Contractures (dynamic or fixed) or simply new pathways of deep tissue motion result
- Our thought for why some patients struggle with modern trend to mix static progressive deep joint mobilization with impact sport

Practical Information

- Typically associated with weak core muscles and poor trunk/proximal limb control
- Weak gluteus maximus musculature
- Therapy to correct is typically effective
- Patients need counseling and reassurance
- When sub-psoas bursitis causes painful snap, ultrasound guided corticosteroid and physical therapy are the best first line of action
Basic Science of the Capsule

- Traditional cadaver descriptive studies
  - Origin/insertion descriptive (Martin et al)
  - Sectioning studies (Safran, Sekiya)
- Premise: ligaments function as “check reign” stabilizers under tensile force at length endpoints

Hip Ligaments (Martin et al)

Zona Orbicularis

- Thick constriction point of hip capsule located at the femoral head/neck juncture
- Point of volumetric entrapment of proximal femur
  - Mosier, Maynard et al. (pending publication)
Potential Explanation for Poor Outcomes in Surgery: Capsule

- None
- Z
- T
- Interportal
- Capsulectomy

Laxity Correction: A rare option

Iliopsoas Impingement

- Domb et al.
- 3 o'clock labrum tear
- Associated with tight psoas and repetitive painful snap
- Transcapsular release and labrum repair shown to be effective
- OPINION: rare.
Cautionary Case

- This is a 22 year old female Division I rower, who presented to us with persistent right hip for two years following arthroscopic labral repair and transcapsular psoas release at an outside center.
- She had been unable to return to her pre-operative level of activity due to the pain. On physical exam, she had pain with flexion and a feeling of weakness in the operative side.

MRI arthrogram

Arthroscopy
Acetabular Labrum
- Fibrocartilage
- Extension of acetabular rim
- Suction-seal
- Load bearing in dysplasia
- Segmental loss OVER 2cm results in instability
- Vascular supply is from the capsular side

Labrum Tear
- Seldes Classification

Tight Hips: OA or FAI?
Femoroacetabular Impingement
- The repetitive abutment between the femoral neck and the acetabular rim that occurs within the normal range of motion
- This group needs more motion than their bone structure permits, resulting in a conflict
- Excess sheer and compressive loads result at the hip bearing surfaces
  - And adjacent areas (SI joint, spine, pubis!)
Two Types of FAI

- CAM impingement
- Pincer impingement
- Mixed type most common!

Functional Classification of Labrum Tear: Looks for a SOURCE

- Traumatic
  - Rare
  - Likely FAI or dysplasia associated
- Atraumatic
  - Attritional separation of articular cartilage from labrum base (FAI or dysplasia)

Case (Courtesy of Dr. Bojan Zoric, Massachusetts)

- A 21-year-old male collegiate golfer presents to the office with increasing pain in the groin and inability to perform over a semester of conservative care. Physical exam is significant for limited internal rotation at 90 degrees hip flexion and reproduction of his pain with passive flexion, adduction and internal rotation of the hip.
Radiographs

Figure 7: Plain radiographs demonstrating mixed pattern TAI and co-located labrum on symptomatic left side (blue arrow).

MRI-arthrogram

Figure 8: Coronal (A) and axial (B) T2 weighted MRI-arthrogram images showing large osicle (arrow) at the area of mixed pattern impingement.

Treatment

Figure 9 (a-c):
a. Arthroscopic image of supraspinatus space and osicle with subluxed labrum labral and meralgia
b. Explanted osicle
c. Arthroscopic image and repair of labrum in region of osicle detachment
Functional Understanding of Lateral Hip Pain in Athletes

Primary lateral pathology
- Typically traumatic diagnosis or reactive to underlying degenerative process
- More common in master’s athletes
- UNCOMMONLY a major issue in first 3 decades

Referred Lateral Pain
- Typically a fatigue or neuromuscular balance issue that may be very treatable conservative
- Lumbar spine history
- “Cleared” lumbar spine does not equal normal lumbar spine
- May be referred from hip joint itself

Coxa Saltans (snapping hip syndrome)
- Clinical descriptive term for feeling or hearing audible “pop” upon hip motion
- Remnant of pre-preservation surgery literature
- Still exists as a presenting symptom for many patients/athletes

Coxa Saltans Externa
- Iliotibial band and tensor muscle complex interacting with lateral greater trochanter
- Patients will have history of a “trick hip” or “hip popping out”
- Demonstrated easily in the office
- Often created by classic “hip therapy” isokinetic exercises
Gluteus Medius Tears

- Master’s Athletes
  - 40’s to 80’s
- True prevalence unknown
- Many case series of open repair in the literature
- Few arthroscopic repair series
- No quality conservative care series
- MUST RULE OUT SPINE PATHOLOGY

Functional Understanding of Posterior Hip Pain

Primary pathology
- Most typical in master’s athletes
  - Hamstrings tendinopathy
  - Ischiofemoral impingement
- Must always be skeptical if no reproducible exam finding exists

Referred Pain
- Typical reason for posterior pain is in this category
  - Spine, spine, spine
  - Osteoarthritis
  - SI joint, hip joint, spine
- Rarely, Ligamentum Teres can refer pain posteriorly in non-arthritic hips
  - Typically associated with instability
Muscle Tears: Hamstring Origin

- Increasingly reported
- Avulsion of common origin of biceps, semimembranosus from ischial tuberosity
- Retraction greater than 2cm of all three tendons or greater than 3cm retraction of 2 tendons surgical care recommended
- Partial tears at origin (tendinopathy)
  - Common in middle aged endurance athletes
  - PRP rarely effective
  - Ischial bursa injection can be effective
  - Rest/avoid eccentric or plyometrics
  - Surgery last option for 6 months or greater of symptoms
    - Arthroscopic and open can be effective

Surgical Care: Proximal Hamstrings

- Several reported series in the literature
  - Cohen and Bradley
  - Larson CL.
- Long term risks of nonoperative care
  - Poor function
  - Sciatic symptoms
  - Sitting pain
  - Reduced effectiveness of surgical care
    - Sekle et al. AJSM. Nov 2014.
- Suture anchor repair of tendon to bone followed by rehabilitation and return to sport at 3-4 months
- Recent systematic review:
  - Van die Med et al. AJSM. 2014

Ligamentum Teres

- LT is an end range stabilizer to hip rotation at 90 degrees flexion
  - Martin HD, Hatem MA, Hatem Mr.
- Arthroscopy. 2014

Diagnosing Tears:
- Deep or even posterior pain
- Common in FAI & Dysplasia
- MRI-Arthrogram is helpful
- Arthroscopy is gold standard

Treatment is conservative
- If failure, then debridement (arthroscopic) and reconstruction have been described
Frontiers: External Hip Impingement

- Conflicting trochanteric-pelvic interaction that leads to soft tissue damage or pain
  - Ischiofemoral impingement
  - Deep gluteal syndrome
  - Sub-spine impingement
    - AIIS to distal neck impingement
  - Trochanteric-pelvic impingement

Ischiofemoral Impingement

- Hal Martin, DO
  - Contact between lesser trochanter of femur and the ischium of the pelvis
  - Sciatic compression, sitting pain
  - NOT a reasonable line of query in obese, non-athlete

Prevention Strategy

- Theoretical exceeds proven scientific evidence
- Logic guided with and OPEN mind for creativity
- Imaging (plain radiographs) after identification of functional range conflict
  - Limited rotatory motion in sport that requires more
  - Excessive rotatory motion in sport that demands load or plyometric explosive force
- Preseason/preparticipation questions designed to identify hip structural “copers”
Conceptual Understanding of Athletic Hip Injury

Functional Demand
Mechanical Structure
Genetic/Biomaterial

Conclusions

- Understanding athletic hip pathology requires a dual search for today’s pain generator and global sport/structure mismatch
- We are at the beginning of an exciting journey that hopes to unite core/kinetic chain concepts with prevention and treatment of end-tissue damage
- Correct diagnosis prior to surgical care is increasingly essential as we learn!
THANK YOU!

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