PATHOANATOMY: GOALS AND OBJECTIVES

- Goal of this lecture: share 40 years of professional experience, enhanced by evidence, built on the structured foundation of IAOM clinical diagnosis and treatment.
- Apply the above specifically to this case study. This is a true NEXT step in application of the on-line and live course material.
- Based on patient history, prepare our minds and ‘hands’ for the clinical examination. The clinical examination is to confirm the initial interpretation after gleaning answers from the ‘W’ questions.
- Present potential differential diagnoses to the case.

WHO:
- 37-year-old male,
- Active duty airborne army medic
- Past medical history of:
  - Bilateral femur stress fractures in 2010 from high volume and load of running
  - Right ankle injury/fracture in 2012
  - Arthroscopic right knee surgery 2006 for patellar chondral defect

WHAT AM I THINKING?
- Associations with early osteoarthritis
- Dysplasia
- Femoro-acetabular impingement
- Previous musculoskeletal injury
- Acute
- Repetitive joint loading
- High intensity sports activity

PATHOANATOMY

PATHOANATOMY

• WHAT:
  - Three (3) year history of right hip pain with insidious onset.
  - Complaints of pain, stiffness and weakness.
  - Occasional popping deep in the right hip

Pain of longer than one year generally, if not always, means we have more than one problem: pain, stiffness, weakness

PATHOANATOMY: THE JOINT

• WHERE:
  - Pain is located in the right groin region and right lateral hip just posterior to greater trochanter.
  - Referred pain to buttck was most common: 71%.
  - Thigh & groin referral, almost equal in frequency:
    • 57% & 55% respectively.


PATHOANATOMY: THE JOINT

• WHEN:
  1. Pain is constant in both the groin and at the posterolateral hip.
  2. Popping with groin pain walking up stairs.

• Aggravating factors:
  - Walking up stairs
  - Walking fast
  - Deep squats
  - Painful with deceleration of fast running or when carrying load
  - Prolong sitting
  - Deep groin pain when getting up from sitting and for the first few steps afterward

• My concerns
  - Will want to investigate the joint. If there is a painful capsular pattern, there will likely be synovitis with joint effusion.
  - What does this mean for the joint long term?

• Very strong joint capsule, with reinforcing ligaments
• Blood supply runs within the synovial sheath

Artery in the teres
Lateral circumflex
Deep femoral
Medial circumflex

Artery in the teres ligament
WHEN:
- Pain is constant in both the groin and at the posterolateral hip.
- Popping with groin pain walking up stairs.

Alleviating factors:
- Unloading and avoidance of loaded activities of the hip
- Rest feels good, but the hip hurts at night after several hours in bed; he cannot lie on it, and it will ease when getting up and walking around for a short period of time. Prolonged sitting, such as at the movies will make it hurt particularly if he is unable to move the leg.

What about the labrum?

PATHOANATOMY - LABRUM

[Images of anatomical structures and textual content about labrum function and tears]

PATHOANATOMY - LABRUM

Why are tears in the superior region?
- In general:
  - Increased mechanical demand
  - Impact loading of head-neck junction against the glenoid rim leads to wearing of the labrum
- Further predisposed in dysplasia
  - Floral hip deformity
  - Head-neck bump deformity

[Images and references related to labrum tears and hip impingement]

PATHOANATOMY - LABRUM

Three Types
- Cam: increased radius neck
  - due to non-spherical femoral head & overdeveloped femoral neck
- Pincer: too much acetabular coverage
  - Due to excessive acetabular coverage
  - Acetabular retroversion
  - Altered acetabular rim
    - Increased angle
    - Irregularities
- Mixed

[Images and references related to different types of labral tears and hip impingement]

PATHOANATOMY - LABRUM

Material: fibrocartilage, with hyaline cartilage at the articular surface, meaning it is a weight bearing structure
- Enlarges acetabulum to 2/3 of a sphere
- Controls deformation
- Joint proprioception
- Capsular attachment

[Images and references related to labrum function and its role in hip stability]
• **WHY:**
  - Insidious onset of right hip pain. He can think of no specific cause, but on further questioning admits to having some 'hard jumps' where he landed awkwardly on the right leg. He might have felt something in the hip or back for a few days afterward, but it always went away.

• Previous/most studies of interosseous pressure are performed with a needle into bone. There is a wide variety of results depending on the micro-climate of the needle;
  - Where a small artery is struck a relatively high interosseous pressure (IOP) is recorded.
  - Where capillaries or veins, fat and trabeculae are penetrated then a lower IOP is found.

• Close correlation between subchondral interosseous pressure, perfusion pressure, and load.
  - Load bearing generates high pressures.

**Consequences of Joint Forces**

- Osteochondral defect
- Bone cysts
- Joint ganglion

**To What Extent:**

- As noted, he has had three years of pain that seems to be gradually worsening. At first it just hurt, and in the past few months it has felt progressively stiffer and weaker. He can still perform his duties and physical activities tasks. Pain is 1/10 at its best and 7/10 at its worst.

- He can experience greater intensity of pain in the groin, that pops and can be sharp; the low-grade constant pain is in both the groin and the posterolateral hip.

With the 3-year history there is likely more than joint and labrum as pain generators. What else could be contributing to the pain, weakness and stiffness?....
• Myofascial trigger points, MTrP's, are a potential pain generator, particularly in longstanding problems.
• Trigger points lead to pain, weakness, and limitation of motion.
• Inter- and intra-tester reliability of active and latent MTrP evaluation was moderate to substantial. Palpation evaluation can be used for clinical diagnosis of MTrP's in the hip and thigh muscles.
• rectus femoris (proximal), vastus medialis (middle and distal), vastus lateralis (middle and distal) and gluteus medius (anterior, posterior and distal)


• Myofascial contributions should be considered in all cases of hip pain. Imaging is difficult.
• One case series (level IV evidence) reported a significant reduction in postero-lateral hip pain in patients with confirmed acetabular labral tears after myofascial treatment.6
• Common trigger points referring to the postero-lateral and antero-lateral hip include the gluteal muscle group (maximus, medius, minimus) and the piriformis, tensor fascia latae, and quadratus lumborum muscles. The iliopectoas and proximal adductor tendons can refer pain into the anteromedial hip and thigh.


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DIFFERENTIAL DIAGNOSES

And Other Considerations in Painful Popping of the Hip

• One or more of the following:
  • Extra-articular
  • Labral tear
  • Cartilage defect
  • Psoas tendopathy
  • Psoas bursa / iliopectineal bursa

• Intra-articular

• 5-10% of general population.
• More common in elite athletes, where pain is aggravated with flexion and rotation
• Described as painful audible clicking sensation emanating from deep in the anterior groin.

GROIN: INTERNAL SNAPPING HIP

Clinical Findings
• Basic Clinical Examination
  • Painful resisted hip flexion
  • Painful resisted hip external rotation
  • Extra tests:
    • Snapping provoked in supine when bringing hip from flexed abducted and externally rotated position to extension and internal rotation
    • Tendinitis: Pain provoked with resisted hip flexion/ER from an extended and IR position
    • Bursitis: Pain provoked with flexion that compresses iliopsoas, just medial to ASIS, and sweep into ER thereby compressing the structure between the pubic ramus and lesser trochanter

Snapping test
Resisted test
Bursa test

GROIN: INTERNAL SNAPPING HIP

- One or more of the following:
  - Extra-articular
  - Psoas tendopathy
  - Psoas bursa

- Treatment for extra-articular:
  - Physical therapy
  - Modification of activity
  - NSAIDs and/or injection
  - Patients can benefit from injection into the bursa. Benefited both in instances of bursitis and tendinitis.
  - Pain relief after injection is a predictor of good outcomes after surgical release


MICRO-INSTABILITY

- Etiology
  - Iliopsoas compromise
  - Teres ligament deficiency
  - Traumatic or non-traumatic. Controversy in diagnosis, imaging, and management
  - Repetitive external rotation and axial loading = capsular redundancy over time
  - History:
    - Locking, catching, giving way, pain elicited without defined injury.
    - Sports with high incidence of dislocation
    - History family: Ehlers-Danlos syndrome, Marfan syndrome, and Down syndrome
  - Differential diagnosis: lumbar, gastrointestinal, vascular genitourinary, snapping hip


Physical Examination:
- Increased ROM with capsular laxity and symptoms = true instability
- Audible Pop: when taking the hip from flexion into extension
- Positive dial test (indicative of a capsular laxity), axial distraction, apprehension test
- May be accompanied by iliopsoas tendinitis, iliobial band syndrome (internal/external snapping hip)
- FAI morphologic characteristics may predispose the hip to instability through anatomic conflict caused by pincer or cam lesions (or both) lowering the femoral head posteriorly.
DIFFERENTIAL DIAGNOSES
And... Other Considerations in Painful Groin (that will not be discussed today)
• Pubic Symphysis
• Adductor Tendinitis
• Incompetent Abdominal Wall (Sportsman’s Hernia)

DIFFERENTIAL DIAGNOSES
Considerations in Painful Groin and Posterolateral Trochanter

ADHESIVE CAPSULITIS OF THE HIP
• (Difficult entity to diagnose.)
• Not related to degenerative changes
• Can be traumatic or idiopathic, like the frozen shoulder.
• Painful limitation of motion, pain with weight bearing.
• Treatment
• Manual therapy – if traumatic or post surgical
• Hydro-distention procedure
• Manipulation under anesthesia
• Arthroscopy


ADHESIVE CAPSULITIS OF THE HIP
• 25-year-old female dancer.
• 7-year history of left hip pain without a specific precipitating event. Found to have a nonossifying fibroma of the femur and underwent excision one year prior to the initial evaluation. Surgery was followed by 6 weeks of nonweight-bearing.
• Unable to walk long distances, unable to sleep due to inability to find a comfortable position, unable to return to dancing due to pain and weakness in the left hip.
• Treatment had consisted of physical therapy for exercise and massage that initially felt good, but no longer seems to be helpful.
• Clinical findings: painful capsular pattern of limited motions
• Diagnostic post-surgical frozen hip.
ADHESIVE CAPSULITIS OF THE HIP

- 35-year-old female surgeon seen for left hip pain.
- Symptoms started while training for a marathon one year earlier. She was able to run the marathon, but afterward pain was significant, and she was found to have a femoral neck stress fracture. She underwent surgery where 3 pins were placed. Now, one year later, she is starting to run again, but with pain and a sense of stiffness.
- Clinical findings: painful capsular pattern of limited motions

ADHESIVE CAPSULITIS OF THE HIP

- 49-year-old nurse seen for back and right hip pain.
- Symptoms started after a snowmobile accident. She received exercises from PT but notes severe weakness with the inability to lift her leg during some of her exercises, which reproduce a pinching pain at the anterior/lateral aspect of the right hip, especially when repetitive flexion/extension is performed. Pain worsens with running or with strenuous exercises.
- Clinical findings: painful capsular pattern of limited motions
- Initial diagnosis: idiopathic frozen hip
- Subsequent diagnosis: traumatic frozen hip.

ADHESIVE CAPSULITIS OF THE HIP

- 62-year-old female retired schoolteacher with right hip and lower back pain that had been bothering her for the past 3 years without apparent precipitating event. She had physical therapy of exercise, and pain management intervention about 2 years ago with no change.
- At initial evaluating she described pain in her right thigh and anterior hip. She was unable to lie on her right side. Increased activity cause her pain to be worse. NSAIDS were helpful. She always wore supportive shoes. She had a bone scan that is normal.
- Clinical findings: painful capsular pattern of limited motions
- Initial diagnosis: idiopathic frozen hip
- Subsequent diagnosis: traumatic frozen hip. Patient recalled between visits that shortly before onset of symptoms, she had slipped on wet leaves while raking and fell with her hip in an awkward position.

TRANSIENT OSTEOPOROSIS OF THE HIP

- Temporary condition of unknown etiology; usually benign and self-limiting. Also known as bone marrow edema syndrome.
- Can be complicated by fracture of progress to avascular necrosis.
- Most common in middle aged men,
- BUT when seen in women it is most often in the latter part of pregnancy.
- Best diagnosed with MRI.
- Should be considered in the differential diagnosis when:
  - Sudden onset of hip pain
  - Gradually resolves within 2 to 12 months
  - In this illustration, left hip

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TRANSIENT OSTEOPOROSIS OF THE HIP

- Three stages
  - Acute onset of pain due to edema, potentially induced by trauma
  - Neurovascular dysfunction, transient hyperemia or microfracture
  - Increased resorption and demineralization of the bone
  - Resolution of the process
- Treatment
  - Bisphosphonates, calcitonin, or teriparatide
  - Minimize weight-bearing activities
  - Heat modalities and interferential current
  - Consider assessing for (subclinical) hypothyroidism, and treat that

AVASCULAR NECROSIS

- Increased risk associated with:
  - Male
  - Smoking, drinking, overweight
  - High cholesterol
  - Corticosteroids, non-site specific
- Diagnosis
  - History: Pain in groin and thigh longer than 6 weeks, worse with weight bearing and movement.
  - Diagnosed with MRI
- Treatment
  - Pre-collapse: core decompression and pharmacological therapy
  - Post collapse: total hip

DIFFERENTIAL DIAGNOSIS OF POSTEROLATERAL HIP PAIN

- Trochanteric Bursa
- Gluteus Minimus, Medius, or Maximus Insertion

Thoughts about clinical findings?

AVASCULAR NECROSIS

- The blood supply runs in synovial membrane of hip. Joint effusion compromises blood supply.
- Potential predisposition for avascular necrosis

Other clinical findings!

Trochanteric Bursa

Gluteus Minimus, Medius, or Maximus Insertion
GREATER TROCHANTERIC PAIN SYNDROME, GTPS

- Recalcitrant lateral hip pain….
- Correlation between trochanteric bursitis, gluteal tendinopathy, iliotibial band (ITB), and lumbar facet joint and disc disease
- May relate to myofascial pain rather than inflammation, however there can be signs of inflammation.
- Higher prevalence in adults with ITB pain or knee osteoarthritis indicates that altered lower limb biomechanics may be related to GTPS.


PATHOANATOMY SUMMARY

What would be important differential diagnoses to consider?
- Joint-related: causing the constant groin/posterior trochanter pain
  - Frozen hip
  - Transient osteoporosis
  - Avascular necrosis
- Groin pain and popping
  - Internal snapping hip, with extra-articular pathology
    - Iliopsoas
    - Iliopsoas/iliopectineal bursa
    - Micro-instability
  - Posterolateral trochanteric pain
  - Greater trochanteric pain syndrome

Who, What, Where, When, Why, to What extent questions have led us to the following clinical reasoning in our case:
- There is likely more than one problem
- Is the constant pain due to an arthropathy, like early osteoarthritis?
- Is the deep groin pain with popping related to labral pathology?
- What are the perpetuators?
- Myofascial and/or fascial dysfunction?
- What kind of a role are the earlier injuries playing?