Objectives

- Identify differential diagnosis for febrile patient with a limp.
- Discuss clinical presentation and diagnostic evaluation for the following conditions: septic arthritis, psoas abscess, osteomyelitis, pyelonephritis and appendicitis.
- Explore management options for each condition discussed.
- Provide pearls to help distinguish conditions with similar presentations.
Differential Diagnosis of Painful Limp in a Febrile Patient

- Gastrointestinal
- Urologic
- Musculoskeletal
- Vascular
- Rheumatologic
- Oncologic
- Infectious Disease

Limp in a febrile patient can represent many different diagnoses that require unique workup and treatment.

Risk Factors to Consider

- Immunocompromised State
  - DM, alcoholism, IVDU, renal failure, AIDS
- Underlying chronic medical illness
  - Inflammatory Bowel Disease, Cancer, infectious disease
- Previous trauma
- Recent illness
- Is Fever caused by a condition unrelated to limp?

Let’s Examine Some Cases…

- Four interactive case presentations of febrile patient with painful limp will highlight the following:
  - Differences in clinical presentation
  - Lab and imaging evaluation
  - Management options
CASE #1

4 YO Female with Fever and Limp x 1 Day

- Patient slipped in the pool and twisted right leg
  - Initially able to weight bear but developed limp and fever later that evening
  - Diagnosed in ED with hip strain and sent home with Ibuprofen

- Returned to ED
  - Worsening leg pain and increasing fever

Clinical Presentation in ED
4 YO Female with Fever and Limp x 1 Day

Physical Exam:
- VS T 40.7, P 164, R 40, BP 139/84
- Anxious and obvious distress although alert and nontoxic
- Right hip externally rotated and abducted with knee flexed
- Refuses to weight bear and severe loss of ROM
- Skin warm but no erythema

Labs:
- WBC 31,700 with 4% bands, 85% segs, 6% monos, and 5% lymphs
- H/H 12.4/35.4
- ESR 39, CRP 8.2

Radiographs:
- Widening of joint space

Treatment: Ortho consult
- Arthrocentesis of right hip
  - Purulent fluid: 80,000 WBCs with 88% segs, 1% monos, and 11% lymphs, 14,000 RBCs
  - Gram stain shows gram positive cocci in chains
- Hospitalized and IV cefuroxime given
- Surgical drainage needed
- Culture: group A beta-hemolytic strep

Ota 2002

Rosen 1996
Discussion of Septic Hip

- Typical Presenting Symptoms: acute onset of fever, joint pain and altered weight bearing
- Typical Physical Exam Findings: Holds leg flexed and abducted with external rotation, pain with passive ROM, inability to WB or limp
- Labs: WBC, ESR, CRP elevated

Kocher Criteria:
- WBC > 12,000
- ESR > 40
- Fever > 101.3
- Non-weight bearing 2/4 warrant joint aspiration

Diagnostics:
- Plain radiograph may show changes in the joint space such as capsular swelling and eventually narrowing of the joint.
- Ultrasound and potentially MRI are better able to evaluate for joint effusion.

Treatment: Drainage and antibiotics
- Goal: Prompt diagnosis and treatment to prevent degenerative changes leading to disability
- Pearls: High doses of NSAIDs help differentiate transient synovitis from septic arthritis

CASE #2
8 YO Boy with RLQ Pain, Fever, Limp

- 3 day hx of periumbilical pain, now localizing to RLQ
- Anorexia, emesis x3, no dysuria
- Physical exam findings

Appendicitis Discussion: Typical Exam Findings

- Maximal point tenderness between umbilicus and ASIS
- Pain in the RLQ with rebound palpation of LLQ
- RLQ pain with passive R hip extension or RLQ pain with resisted R hip flexion
- RLQ pain w/ passive flexion and internal rotation of R hip with R knee bent
- McBurney’s Point
- Rovsing’s Sign
- Psoas Sign
- Obturator Sign

8 YO Boy with RLQ Pain, Fever, Limp

- Labs
  - Leukocytosis >10,000, CMP, UA WNL
- Imaging
  - US unavailable.
  - CT: Enlarged, thickened appendix, obstructed lumen. Possible perforation
- What is your diagnosis?
- Treatment: Laparoscopic appendectomy

Lapin and Baker 2010
## Appendicitis Discussion

- **One of the most common causes of the acute abdomen worldwide**
- **Typical Symptoms:**
  - Abdominal pain, anorexia, N/V
  - Initial sx’s might be nonspecific
- **Typical Exam Findings:**
  - McBurney’s point tenderness, Rovsing’s sign, Psoas sign, Obturator sign

Debnath 2017, Lapus and Baker 2010

<table>
<thead>
<tr>
<th>Labs</th>
<th>Mild leukocytosis in most patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostics</td>
<td>In pediatric pt, surgical consult prior to imaging may be recommended</td>
</tr>
<tr>
<td>US</td>
<td>Appendiceal diameter of &gt;6 mm</td>
</tr>
<tr>
<td>CT</td>
<td>Enlarged, thickened appendix, obstructed lumen, appendicolith</td>
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</table>

**Treatment**

- Appendectomy - standard of care for most patients with uncomplicated acute appendicitis
- Antibiotic therapy in subset of patients

Debnath 2017, Lapus and Baker 2010

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**CASE #2**

2 YEARS LATER
2 Years Later… Boy presents with RLQ Pain, Fever, Limp

- As we will see, the cause of these symptoms was two very different etiologies

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2 Years Later… Boy with RLQ Pain, Fever, Limp

- Clinical Presentation
  - RLQ pain, fatigue, anorexia, one episode of nonbilious emesis
  - 2.5 week history of R hip pain, limp, and intermittent fever (<102).
  - Surgical history negative except for appendectomy

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Boy with RLQ Pain, Fever, Limp

- Vitals: All stable. Antalgic Gait. Pt appears ill, but nontoxic

- All exam findings without abnormality except for below:
  - Abd- soft, ND. BS x4. Tenderness to R midaxillary line. R CVA tenderness. 10 cm firm, tender mass R flank without erythema, warmth, fluctuance.

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Boy with RLQ Pain, Fever, Limp

- Labs
  - CBC: WBC 25,000, mild anemia
  - ESR: elevated (76)
  - UA: WNL
- Imaging
  - CT abd/pelvis: Large retroperitoneal mass
  - US: Multiloculated fluid collection with calcifications in iliopectoas region communicating with R lumbar abdominal wall

Lapua and Baker 2010

Thoughts on Diagnosis?

- Iliopsoas Abscess

- More to come about iliopsoas abscess later in presentation...

Lapua and Baker 2010
**6 YO Girl with Hip Pain, Fever, and Limp**

- **Clinical Presentation**
  - Right hip pain x 5 days
  - Difficulty weight bearing
  - No history of trauma or recent illness
  - Fever 39.5°C

- **Physical Exam**
  - Hip held in flexion with anterior joint tenderness
  - Mild tenderness also noted to right iliac fossa
  - Passive and Active ROM restricted due to pain

- **Labs:** Neutrophilia with left shift
  - Elevated CRP and ESR
  - Radiographs: negative
  - Initial diagnosis of septic hip arthritis

- **Treatment**
  - Open irrigation and drainage performed and IV antibiotics given
  - Blood and joint fluid were positive for staph aureus
  - Following day, CRP and ESR raised and fever maintained. 2nd washout performed.

- **MRI performed**
  - Fluid collections of right iliacus and iliopectoas
  - Abnormal marrow signal in right iliac wing
  - Findings consistent with osteomyelitis

- **Open surgical debridement**
  - Abscess of the iliopectoas muscle with extensive pus

- **IV antibiotics continued and switched to oral after 30 day hospital stay**
### Discussion of Osteomyelitis

- Pelvic osteomyelitis is uncommon
  - Average onset between 7-14 YO
  - Causative organism most commonly staph aureus
- Typical Presenting Symptoms
  - Gradual onset of dull hip or thigh pain, altered weight bearing, and fever
- Typical Exam Findings: warmth, erythema, tenderness
  - Flexion of hip from illoposas irritation
  - Passive ROM typically preserved

### Labs
- Leukocytosis if more acute, ESR/CRP normal or elevated, blood cultures positive in 50% of cases
- Diagnostics: Plain radiographs and CT vs MRI (gold standard)
  - Initial radiographs may be normal taking 2-3 weeks to become visible
  - Bone biopsy with culture
- Treatment: Pelvic osteomyelitis without abscess may only require IV antibiotics
  - Failed treatment, abscess, or extensive involvement requires both debridement and antimicrobial therapy

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**CASE #4**
62 YO Female with R Back/Hip Pain

- Healthy with Hx of intermittent LBP and trochanteric bursitis
- CC: Mid to low R back pain with R hip pain ("similar to previous episodes")
- Recently working in the garden with extensive bending twisting.
  - “Overdid it in the garden.”

62 YO Female with R Back/Hip Pain

- No dysuria, frequency, urgency, hematuria, fever, abdominal pain, CP, SOB, hx of stone or pyelo.
  - Remainder of exam normal with no CVA tenderness

62 YO Female with R Back/Hip Pain

- Dx: MSK source of pain
- Tx: NSAIDs, stretching, call if Sx’s change, persist or increase

- 2 days later, dysuria, fever, increased pain. Now has R CVA tenderness.
- CBC: leukocytosis
- UA: pyuria, bacteriuria, +nitrites, +leukocyte esterase, WBC casts. Culture obtained
- Diagnosis?
  - R pyelonephritis
Discussion of the Pyelonephritis

- Typical Symptoms:
  - +/- cystitis Sx's, fever (>38°C), chills, flank pain, N/V
- Typical Exam Findings:
  - CVA tenderness
- Labs: UA, urine culture
- Diagnostics
  - If severely ill or concern of stone or other risk factors
    CT or US warranted

Talan 2016

Discussion of the Pyelonephritis

- Treatment: Out pt vs. In pt Abx tailored to individual patient
  - Severity
  - Urine culture results
  - Underlying urologic conditions

Talan 2016

CASE #5
Hip Pain in a Football Player

- Healthy 19 YO Division 1 college football player
- Twisting injury anterior hip
  - Felt pop and immediate pain
- Thoughts on diagnosis?
- Diagnosis: Groin Strain
- Treatment: Rest, Ice, NSAIDs

Moriarty and Baker 2016

Groin Injury in a Football Player

- 4 days post injury
  - Worsening groin pain
  - Fever
  - Increasing fatigue
  - Nausea, diarrhea
- Thought on diagnosis?

Moriarty and Baker 2016

Groin Injury in a Football Player

- Pt referred to ED
- Clinical Presentation
  - Vitals: BP-114/68, P-109, T- afebrile
  - CV: RRR no murmur
  - LCTA
  - Abd: soft, NT, ND
  - R hip exam limited due to pain
    - Pt held hip in flexed and ext. rotated position

Moriarty and Baker 2016
Are labs/diagnostics necessary?

- CBC - WBC: 17,000
- CT abdomen/pelvis
  - R iliopsoas muscle enlargement with a small avulsion fx at lesser trochanter

Pt admitted
- MRI ordered - delayed due to inability to extend hip 2° pain
- Condition declined
  - Rhabdomyolysis and vitals became unstable
  - Pt transferred to ICU for Tx of sepsis and AKI
  - Broad spectrum Abx given

Hospital Day 2: Septic shock with multisystem organ dysfunction
- Repeat CT - Possible pyomyositis R psoas
- Surgical exploration of R retroperitoneum: Minimal turbid fluid, no purulence

Hospital Day 3: Further decline
- MRI: 14 x 5 cm abscess R iliopsoas
- Surgical washout, debridement and culture (MRSA)
- Targeted antibiotic therapy
- Pt made complete recovery
Psoas Abscess

Epidemiology
■ Rare, although frequency increasing
■ First described in 1881 as psotis

Definition: Infection within the iliopsoas muscle compartment
■ Primary - Infectious source is unknown
  ■ Hematogenous or lymphatic spread
■ Secondary - Causative disease, condition or event is known
  ■ Infection spreads from adjacent or more distant structure

Mynter 1881

Risk Factors
■ Primary: DM, Alcoholism, IVDU, renal failure, AIDS
■ Secondary: Vertebral TB (developing countries), IBD, osteomyelitis, discitis, pelvic/intraabdominal malignancy, GU infection, intervention or instrumentation.

Mallik 2004

Microbiology
■ Primary: Typically, caused by one organism
  ■ Staphylococcus Aureus (88%)
  ■ Streptococcus species and E. Coli
■ Secondary: Can be mono/polymicrobial
  ■ TB common cause in developing countries
  ■ E. Coli, streptococcus species, Proteus, Klebsiella, mycotic elements

Alif Adlan 2016
Psoas Abscess

Clinical Presentation

- Classic triad: Back pain, limp, fever (8% of cases)
- Often insidious onset with nonspecific symptoms
  - Malaise, LG fever, abdominal or flank pain

Physical Exam

- Stooping gait
- Flexed and Ext rotated Hip
  - Increased pain with ROM
- Psoas sign (lacks sensitivity)
- Swelling or tender mass

Differential Diagnosis is vast

Diagnosis: The key is Clinical Suspicion

Labs

- Leukocytosis (>15,000), Anemia, Elevated BUN, Increased CRP/ESR, +/- pyuria
- Blood cultures identify specific organism

Imaging

- CT is gold standard
- MRI helpful to visualize soft tissue
- US minimal benefit

Treatment

- Appropriate antibiotics
  - Broad spectrum Abx (in both primary and secondary) until final culture results available
- Abscess management
  - Percutaneous aspiration
  - Surgical Intervention
    - Laparoscopic or Open Surgical Drainage
Draining Psoas Abscess

<table>
<thead>
<tr>
<th>Psoas Abscess</th>
<th>Appendicitis</th>
<th>Septic Hip</th>
<th>Pyelonephritis</th>
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<tbody>
<tr>
<td>Presentation</td>
<td>Severe pain (back, flank, abdominal), fever, chills, groin, or percutaneous site, Tenderness, Mass, N/V, Anorexia, Leukocytosis, Elevated ESR/CRP</td>
<td>McBurney’s point tenderness, N/V, Anemia, Fever, Decreased ROM, Joint swelling, Erythema</td>
<td>+/− cystic Sa/Se, Fever (&gt;38ºC), Chills, Flank pain, Anemia</td>
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<td>Labs</td>
<td>WBC &gt; 10k, ESR, CRP, Anemia, Blood culture</td>
<td>Mild leukocytosis &gt; 10k, +/− elevated bilirubin (perf)</td>
<td>Bacteria in synovial fluid aspiration, Blood culture in joint, ESR, CRP</td>
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<td>Imaging</td>
<td>CT Gold Standard, US, CT abdomen</td>
<td>Soft tissue swelling [x-ray, MRI]</td>
<td>CT or US in severe cases or with risk factors</td>
</tr>
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<td>Treatment</td>
<td>Abs and drainage</td>
<td>Appendectomy gold standard</td>
<td>IV Abr and joint drainage</td>
</tr>
<tr>
<td>Pearls</td>
<td>Immunocompromised: Primary - Kids, Secondary - &gt;10Y</td>
<td>Most common in 2nd and 3rd decade, Psoas, Rovsing, Obturator</td>
<td>Age &gt; 80, DM, RA, Joint prosthesis, Steroid injection, CAD</td>
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Clinical Suspicion for IPA

Imaging:
- CT (gold standard)
- MRI

Labs:
- CBC, ESR, CRP, UA, Blood cultures*

Initiate empiric antibiotics**

Culture results guide Abx treatment

IPA drainage (percutaneous or open)

*Leukocytosis, elevated CRP/ESR, (+/-) pyuria, (+) blood cultures**

Staph aureus most common cause, include MRSA coverage

Preferred Tx: Vancomycin + gram negative and anaerobic coverage

Labs (+) Imaging negative

Labs and/or imaging (+) IPA suspicion

Labs/imaging (-) IPA unlikely

Figure 2: Clinical Suspicion for IPA Flowchart

https://youtu.be/2BG9WklPSQR? t=3m24s

Presentation

Pain (back, flank, abdominal), fever, chills, groin, or percutaneous site, Tenderness, Mass, N/V, Anorexia, Leukocytosis, Elevated ESR/CRP

McBurney’s point tenderness, N/V, Anemia, Fever, Decreased ROM, Joint swelling, Erythema

Mild leukocytosis > 10k, +/− elevated bilirubin (perf)

Bacteria in synovial fluid aspiration, Blood culture in joint, ESR, CRP

CT Gold Standard, US, CT abdomen

Soft tissue swelling [x-ray, MRI]

CT or US in severe cases or with risk factors

Abs and drainage

Appendectomy gold standard

IV Abr and joint drainage

Abs tailored to individual patient

Immunocompromised: Primary - Kids, Secondary - >10Y

Most common in 2nd and 3rd decade, Psoas, Rovsing, Obturator

Age > 80, DM, RA, Joint prosthesis, Steroid injection, CAD

Consider population based studies on resistance. Close f/u.
Summary

- Multiple conditions may present with an acute limp
- When the patient is also febrile, a potential infectious cause must be evaluated urgently
- It is key for the clinician to consider a variety of conditions that may present similarly to prevent delay in diagnosis
- Clinical suspicion with timely and appropriate evaluation is critical
- Remember the zebra of psoas abscess in patients with a febrile limp
- Consider “Expanding the Differential”

References