Musculoskeletal Management of A Limping Child

Julieanne P. Sees, DO, FAOAO
Pediatric Neuro-Orthopaedic Surgeon
Medical Director, Neuro-Orthopaedic Rehabilitation Unit
Wilmington, DE
Objectives

- Identify common disorders: Age is helpful
- What to order
  - Labs: CBC, ESR, CRP
  - X-rays, Bone scan, CT, MRI
- When to refer

Let’s Start

What to do for … the child with a Limp?
No Disclosures
Introduction

• Important approach
  • systematic and orderly manner
• Thorough H&P
• Inspect
  • joints: swelling, effusion, erythema, warmth
  • muscle atrophy, deformity, symmetry
• Note range of motion & pain

• Observe gait
## Limping in Various Age Groups

<table>
<thead>
<tr>
<th>Toddler (1-3 years)</th>
<th>Child (4-10 years)</th>
<th>Adolescent (11+ years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient synovitis</td>
<td>Transient synovitis</td>
<td>Slipped capital femoral epiphysis</td>
</tr>
<tr>
<td>Septic arthritis</td>
<td>Septic arthritis</td>
<td>Hip dysplasia</td>
</tr>
<tr>
<td>Diskitis</td>
<td>Legg-Calve- Perthes</td>
<td>Chondrolysis</td>
</tr>
<tr>
<td>Toddler’s fracture</td>
<td>Discoid meniscus</td>
<td>Overuse syndromes</td>
</tr>
<tr>
<td>Cerebral Palsy</td>
<td>Limb length discrepancy</td>
<td>Osteochondritis dissecans</td>
</tr>
<tr>
<td>Muscle dystrophy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental Dysplasia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RARE: Leukemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoid osteoma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Infant and Toddler

- Occult fx
- Septic Arthritis
- Osteomyelitis
- Toxic Synovitis
- Leukemia
- Child Abuse

- Cerebral Palsy
- Muscular dystrophy
- DDH
- Coxa vara
- Pauciarticular JA
- Diskitis
School-Aged Children

- Fracture
- Septic arthritis / Osteomyelitis
- Toxic synovitis
- Leukemia
- LLD
- Legg-Calve-Perthes disease
- Tumor: Ewing’s sarcoma
Adolescent

✦ Fracture
✦ Sprain, strain, overuse syndromes
✦ Hip dysplasia
✦ Osteochondritis disecans
✦ Gonococcal arthritis
✦ Slipped Capital Femoral Epiphysis (SCFE)
✦ Tumor: Osteosarcoma
Abnormal Gait Patterns

- Antalgic gait
- Trendelenburg gait
- Proximal muscle weakness gait
- Spastic gait
- Short-limb gait
Antalgic Gait

- Caused by pain in LE or back (most common)
- Child takes quick, soft steps on the leg (“short-stepping”)
  - Reduces time of extremity in stance phase
  - Normal limb longer in stance phase
- If source is hip = lean toward affected side decreasing abductor force across the hip
Trendelenburg Gait

• Functionally weak hip abductors

• During stance: hip abductors function ineffectively pelvis tilts away from affected side

• Child compensates leaning over affected hip
Proximal Muscle Weakness Gait

- Lack of hip extensor strength causes increased lordosis of the lumbar spine in order to remain upright
- Gower’s sign
- Usually seen in muscular dystrophy
Short-limb Gait

- **Gait asymmetry:**
  LLD $> 3.7$ to $5.5$ cm

- **Toe-walking:**
  keeps pelvis level
  idiopathic
  neurologic

- **Hip and knee flexion**
  of longer extremity
  in stance
Inflammatory and Infectious Disorders

- Transient (Toxic) Synovitis
- Septic Arthritis
- Osteomyelitis
- Diskitis
- Pauciarticular Juvenile Arthritis
Transient (Toxic) Synovitis

- Most common cause of LE pain
- Inflammation of synovial membrane
- Age: 18 months – 10 years
- Rapid onset of hip pain, limited joint ROM, limping (or inability to walk)
- Often hx of antecedent viral illness
- Rare fever, normal WBC, CRP, ESR <30
- U/S shows effusion
Transient (Toxic) Synovitis

- Aspiration may be necessary to r/o septic arthritis
  - WBC 5,000-15,000, > 25% polys

- Tx:
  - Brief period non weightbearing
  - NSAIDs
  - Most resolve within 2 weeks
  - Recurrence 4-17% within 6 months
Septic Arthritis

- Microbial invasion of joint spaces
- **Hematogenous spread**
- Urgent medical management
  (differentiate from transient synovitis)
- Acute onset of joint pain
  - limp or refusal to walk
  - hx of mild trauma or concurrent infx/illness
- Progresses to febrile systemic illness

- Age < 10 years
- Approx. 90% lower extremity
- Monoarticular
Septic Arthritis

- **Physical exam**
  - Holds affected extremity immobile
  - Joint swelling, erythema, warmth, tenderness to palpation
  - **Pain with passive ROM**

- **WBC, ESR elevated** (Kocher. JBJS 2004)
- **CRP > 2mg/dL** (Jung. JPO 2003)
- **Blood Cx positive in 50%**
- **X-ray changes 7-10 days**
- **Definitive DX: synovial fluid**

- **Staph Aureus most common**
  - R/O group B strep in toddler
- **CALL Ortho: Treatment is Surgical I&D**
Osteomyelitis

- Antalgic gait
- Toddlers and children – localized swelling, pain, pseudoparalysis, fever/toxic
- Adolescents may be more indolent
- Xrays and MRI are helpful

- Hematogenous spread –
  S. aureus most common
  (also GBS, Diplococcus pneumoniae)

- Rx: antibiotics +/- surgery I&D
Diskitis (Infectious Spondylitis)

- Back pain interferes with normal walking / bending forward (refuses to pick up object from floor)
- Not appear ill, ESR elevated in 80%
  - S. aureus most common
- With time: XRs show narrow disk space & bone irregularity
- Bone scan may help localize
- Rx: systemic abx, +/- bracing
Pauciarticular Juvenile Arthritis

- Most common type of juvenile arthritis
- Mild limp in children 2 y of age
- Girls:boys 4:1
- Lab values normal, 50% with normal ANA
- Most commonly involved joints
  - Subtalar, ankle, knee with limited ROM

- Refer to rheumatologist
Neurologic Disorders

• Cerebral Palsy
• Muscular Dystrophy

• Consider if child has always had an abnormal gait

• Delayed start to ambulation (>18 months)
Cerebral Palsy

- Spastic gait
- Diagnostic challenge in mild CP
- Hx: premature, develop delays
- Limited ROM in ankle/knee
- Hyperreflexia, clonus

Refer to orthopaedist
Muscular Dystrophy

• Proximal muscle weakness gait
• Usually first noted in boys 2-5 y
• Hx: delayed ambulation, frequent stumbles, falls, difficult climbing stairs
• Gower’s sign, toe-walking
• +/- pseudohypertrophy of calf
• Elevated serum CPK

• Refer to neurology
Anatomic Disorders

- Developmental Dysplasia of Hip (DDH)
- Legg-Calve-Perthes Disease
- Slipped Capital Femoral Epiphysis (SCFE)
- Toddler’s Fx
- Growth plate fracture
- Overuse syndromes
- Limb length discrepancy
- Femoral Torsion
- Tibial Torsion
- Foot deformities: clubfoot
DDH

- Painless limp in toddler (trendelenburg gait)
- Femoral head partially or completely displaced from acetabulum
- Slight delay in ambulation (14-15 mo)
- Shortened lower extremity with restricted abduction of affected hip
- If bilateral, waddling gait with swayback (excessive lumbar lordosis)
DDH

- Radiographs at 6 mo or older
- Hip pain and limp may not present until adolescence
Legg-Calve-Perthes Disease

- AVN of proximal femoral epiphysis in children 4-12 yo
- Boys:girls 4:1

- Antalgic gait exacerbated by physical activity, alleviated by rest, worse later in day +/- night pain

- Exam depends on severity – greater loss of abduction and internal rotation with more severe disease
Legg-Calve-Perthes

- Initial radiographs
  - Slight lateralization with slightly smaller FH nucleus
  - 1/3 of cases = subchondral lucency in femoral head on lateral
- As disease progresses:
  - collapse and fragmentation of femoral epiphysis
- Refer to Ortho
  - MRI and bone scan: early before radiographic changes
Slipped Capital Femoral Epiphysis (SCFE)

- Antalgic gait in adolescent
- Capital femoral epiphysis displaces posterior & medial on femoral neck
- Slippage
  - acute or gradual
- Boys (12-15 y) > girls (10-13 y)
- Younger: metabolic / endocrinopathy Age < 10 or >16, non-obese (hypothyroid, low GH, pituitary tumor, renal osteodystrophy)
SCFE

- Constant, mild pain in hip, groin, thigh or KNEE in overweight kid
- Pain with passive ROM, decreased internal rotation/abduction
- Hip is flexed, LE rotates externally
- Acute slippage has increased incidence of AVN

- Dx with AP/lateral radiograph
- Bilateral in 1/3
Toddler’s Fracture

• Torsion injury produces spiral fx of tibia without fibular fx
• Initial XR may appear normal
• F/U XR in 1-2 wks show new bone

Treat with short term immobilization
3-4 weeks
Anatomy Unique to Skeletally Immature Bones

Epiphysis, physis, metaphysis, diaphysis

Periosteum - thicker, osteogenic, attaches firmly at periphery of physis

Bone - more porous, ductile
Fractures Common only in Skeletally Immature

Physeal injuries -
“weak link”= physis

Buckle or Torus

Plastic Deformation

Greenstick Fracture
Salter - Harris Classification

Type I - through physis
Type II - through physis & metaphysis
Type III - through physis & epiphysis
Type IV - through metaphysis, physis & epiphysis
Type V - crush injury to entire physis
Vast majority of pediatric fractures treated by closed methods
Except - open, Salter III & IV, multi-trauma

Attempt to restore alignment
(do not always rely on remodeling)

Gentle reduction of physeal injuries
(traction first, adequate relaxation)
Remodeling of Children’s Fractures

Occurs by physeal & periosteal growth changes

Remodel best in younger children & if near a rapidly growing physis

Has to be reduced to remodel

Cast most fractures, no worry for stiffness
Growth Arrest Secondary to Growth Plate Injury

Complete cessation of longitudinal growth = limb length discrepancy

Partial cessation
angular deformity if peripheral
progressive shortening if central
Limb Length Discrepancy

Apparent in children 4-10 yo
Toe-walk to keep pelvis level
To accurately measure:
  child stands with shorter extremity on blocks until the pelvis is level
Need standing film of entire lower extremities
Overuse Syndromes

Apophysitis (Osgood-Schlatter)
  Point tenderness at tibial tubercle

Apophysitis: (Sever)
  Point tenderness at calcaneus growth plate

Stress Fx’s
Bone scan
Normal Torsion
Clubfoot: congenital malalignment of the foot and ankle

If left untreated, clubfoot persists as rigid deformity
Weightbearing surface is dorsolateral midfoot

Treat: early
Serial manipulation and casting Ponseti technique
Neoplasms

Leukemia

Most common cancer in children < 16 y
Peak incidence 2-5 y

20% with musculoskeletal c/o =
Joint symptoms & bone PAIN causing limp

Fatigue, skin bruising, & bleeding, hepatosplenomegaly should alert clinician

Initial XRs unremarkable, or transverse zones of lucent metaphyseal bands adjacent to physis
Dx: Labs, Bone marrow aspiration & biopsy
BONE LESIONS

Size
Location
Description
  Sclerotic
  Blastic
  Lytic
  Expansile
Single vs multiple
BONE LESIONS
Final Thoughts

Remember pediatric skeletal differences

Diagnose common conditions

Listen …
the kid will give you the answer!
Take Home Points

Differential of common conditions
Age, history, PE

Know what to order & what to look for
Fractures, deformities, disorders

If you are unsure, ask for help - Phone a friend

Repetition is key: the more you see, the more you review, the more comfortable you will feel
Thank you for your kind attention
REFERENCES

Mettler. Essentials of Radiology, 2nd ed.
http://www.med-ed.virginia.edu/courses/rad/
www.dictionary.com
www.orthobullets.com
www.AAOS.org
Google Images