



The Limping Child

The child who presents to the emergency department with a limp can present a diagnostic and management challenge. What are the appropriate laboratory and radiographic studies? Through the use of representative cases, the lecturer will discuss the most effective diagnostic evaluation and initial management strategy for the limping child.

- Describe an algorithm for evaluation of the child with a limp.
- Discuss the initial management for a child with a septic joint, toxic synovitis, aseptic necrosis, or slipped capital femoral epiphysis.

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FACULTY

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THE LIMPING CHILD

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I. Introduction

A. Definitions

1. Limping: abnormal gait that minimizes weight bearing on affected limb to reduce pain and instability. It may be secondary to weakness, deformity, or pain.
2. Any alteration in a normal gait can be called a limp; general causes are pain, weakness, or any abnormality of spine, pelvis or legs.
3. Limping is either antalgic gait (painful) or Trendelenburg gait (non-painful).
4. Gait cycle : five events of heel strikes and toes off + two phases: stance / swing.
5. Stance phase: two feet on the ground; swing is when limb is advanced forward without ground contact.
Painful gait: stance phase is shortened ; in non-painful stance phase is equal but child will lean over involved extremity for balance.
Painful gaits usually from trauma, infection, neoplasia, rheumatological;
non-painful gaits usually from muscular or developmental disorders.
6. Cadence : Steps per minute; children walk with faster cadence than adults.
7. Velocity : distance traveled per unit time

B. “Normal Walking Development”^{1,2}

1. Pull to stand at 8-9 months; cruise (walk holding on) at 9-10 months.
2. Average walking independently at 12 months, joints more flexed, lower center of gravity for better balance; arm motion not coordinated yet.
3. By two years, decreased cadence but increase velocity.
4. By three years, most of adult patterns present.
5. Able to stand on one foot for one second at 2.5 to 3 years old.

II. Historical and Physical Exam Highlights

A. History

1. Nature of time course,
2. Possibility of trauma
3. Location of discomfort; hip pain is usually acknowledged as knee, thigh or groin pain by small children!
4. Associated symptoms like fever, “not acting right”, decreased appetite
5. Be alert for child abuse when hx, pe and dx don’t match up!

B. Physical Exam

1. Examine smaller children with only diaper / underpants on.
2. Note how child holds lower extremities at rest; are they flexed or externally rotated to take stretch off the hip?
3. Do complete exam first before focusing on lower extremities.
4. Check skin thoroughly for problems, search for splinters especially on feet!
5. Ask parent about concerns - what looks wrong?
6. Distract child while examining hip, knee, ankle.
7. Have child walk toward parent if possible, walk or run down hall.
8. Check leg lengths.

III. Age Groupings and More Common Problems

A. Age 1-4 (Toddlers) **Afebrile**

1. Transient synovitis
 - a. also known as “toxic” synovitis (older term, parents get upset!)
 - b. most common cause of hip pain in this age group, peaks at 3-6 years, but can be seen from ages 2-12, some cite occurrence in 3% of all kids
 - c. slightly more common on right than left³, other authors declare it equal
 - d. most authors cite males > females from 2: 1 to 5:1, my experience is overwhelmingly male, almost no females
 - e. normal stature, may be slightly obese
 - f. possible causes: recent viral URI, otitis, pharyngitis (what kid this age hasn’t?), recent trauma but no clear cut link drawn, ? allergic hypersensitivity
 - g. kids are afebrile, have no constitutional symptoms, hold leg in flexion, slight abduction and external rotation; have pain with internal and external rotation of hip, painful to bear weight; complain of knee pain
 - h. develops rapidly over hours- may even wake up with problem
 - i. lab values of CBC, ESR, CRP, all NON productive (I don’t do)
 - j. routine films should be AP pelvis and frog lateral (don’t forget to shield genitals on second view)
 - k. ultrasound may show effusion but NOT necessary
 - l. **THERAPY:** Bed rest for several days IF child will cooperate; NSAID’s may help palliate pain but won’t shorten course; give boys a urinal for home!
- m. It can reoccur within 6 months in 4-17%; few progress to Legg-Calve-Perthes disease, but assure follow up. Take a low key approach!! Warn to return if fever starts, change in overall condition, etc.
2. Trauma-witnessed or unwitnessed - 20% < age 5 have fracture with acute limp¹
 - a. ascertain if longitudinal force applied from fall or if rotational torque occurred; palpate firmly along entire lower extremity and tune in for elevation of crying from non-verbal child to guide x-ray selection
 - b. often, you can’t initially localize pain and need views of entire lower extremity

- c. Buckle fractures- can occur anywhere along lower extremity, resulting from fall with longitudinal force; can be subtle and easily missed on plain films if proper views aren't obtained; can even get buckle of 1st metatarsal
- d. Growth plate injuries- be wary of these with any pain and swelling at a joint; be sure to order specific views to avoid a miss
- e. Toddler's fracture or spiral fracture- can occur while child learning to walk, gets foot planted and caught and body twists; can occur in both femur or tibia, be wary of any unexplained spiral fractures- think child abuse!
- f. Normal nutrient vessels can resemble long bone fx's; don't cross cortex, not tender on palpation, lucency and configuration different
- g. Metaphyseal corner "chip" fractures especially at knee are abuse!
- h. femur fractures are not universally abuse, can be from accidents⁴
- I. Most common diagnosis (no stats available, just my own experience) is contusion-a dx of exclusion after careful H+P, x-rays.
parents need reassurance, discuss follow-up, when expect child better

3. Congenital Problems

- a. Developmental dysplasia of the hip- hopefully diagnosed in first few months; if not, leg length discrepancy, and Trendelenberg gait
- b. Cerebral palsy- can be unilateral or bilateral, can be very subtle with just mild spasticity; kids may be persistent "toe-walkers"

4. Neoplasia

- a. Leukemia is most common malignancy in childhood; can present with extremity pains and limp. X-ray findings: Radiolucent metaphyseal bands lytic or sclerotic lesions, and periosteal new bone formation.
- b. One large series of 77 new dx of leukemia, 11.6% CC= limp! 6
- c. Neuroblastoma- 8% of childhood tumors with median age of 2; metastases to bone already present in 70% of diagnosed kids¹- pain with constitutional

SX

B. Ages 1-4 (Toddler) **FEBRILE**

1. Septic arthritis

- a. Most common in 1-2 year age group, males > females
- b. Most in lower extremities (90%), mostly monoarticular, knee most common
- c. Result from hematogenous spread, spread from adjacent source, trauma
- d. *Staph aureus* leading cause in all age groups, *H.influenza* now rare
- e. *Salmonella* shown to be worldwide leader in sickle cell patients⁵
- f. Present with fever, (maybe none in neonates), increasing pain, limit motion with joint held to minimize pain (hip flexed, externally rotated and abducted)
 - g. labs: ESR (95% elevated), CRP (increases earlier), WBC (1/4 can be nl)
 - h. plain films not definitive; may see blurring of fat planes
 - I. joint fluid analysis and irrigation are imperative ASAP, get blood C+S, start

meds-cover for *Staph*- include Vancomycin at 40 mg / kg / day q6h
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2. Osteomyelitis

- a. Uncommon (1 in 5,000 kids) , same bugs as septic arthritis
- b. fever and bone pain are chief complaints
- c. swelling and inflammation of overlying soft tissues
- d. lab values akin to septic joint
- e. plain films: 1st see soft tissue swelling and fat displacement; 1 week later see hazy metaphysis then subperiosteal new bone formation
- f. bone scans can be positive in first 1-2 days
- g. immediate surgical debridement; start meds ASAP
- h. recent concern about penicillin resistant pneumococcal infections; multi center report in Dec. 1998 demonstrated similar clinical response, new vaccine may eliminate many of these cases 7

3. Diskitis (discitis)

- a. subset of osteo- inflammation of intervertebral disc usually from L1-L5.
- b. besides limp, younger kids have back pain, cry when picked up!, and other constitutional symptoms
- c. *Staph* most common, other gram negatives, recently *Kingella*
- d. plain films normal first few weeks, bone scans positive 1 week, MRI early
- e. spinal epidural abscess present with similar symptoms
- f. immediate ortho involvement as above

4. Juvenile rheumatoid arthritis

- a. Most common type- pauciarticular Type I- in girls < 4 years
- b. Usually one joint, knee, with increased ESR, WBC
- c. Mild anemia, hepatosplenomegaly
- d. RF negative, ANA positive
- e. 1/3 with iridocyclitis
- f. Other types (systemic JRA, polyarticular) begin with more insidious symptoms

5. Sickle Cell Patients (+ / - being Febrile)

- a. Before screening, patients presented in first 1-2 years with dactylitis (vaso-occlusive crisis of hands and feet)
- b. Great increase risk for *Salmonella* infections

C. Ages 4- 12 (Pre-School and School Age)

1. Legg-Calve-Perthes Disorder (Perthes)

- a. Uncommon (1 per 1 K to 1 per 10K), age 4-9, males> females, bilateral in 10%, Caucasians > Afro-Americans
- b. Risks: low birth weight, short stature, delay in skeletal maturation
- c. ischemia to femoral head-? hyper viscosity, hyper blood clotting, endocrine
- d. insidious increased limping, pain to groin, knee, thigh

- e. history of minor trauma may delay dx

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- f. limb-length discrepancy may be measured
- g. repair and resorption of necrotic bone give the x-ray findings -late
- h. first x-ray findings: femoral head smaller, widened cartilage space
in first few months, subchondral lucency may be seen
later x-ray findings: dense femoral epiphysis
late findings: fragmentation and collapse
- I. process lasts 2-4 years, rx directed at reducing pain and deformity

2. Bone tumors

- a. Benign fibrous cortical defects -asymptomatic but cause bone pain when large
- b. Osteochondroma- bony outgrowths usually near knee; most common
- c. Osteoid osteoma- males > females; pain at nighttime, see radiolucent nidus of osteoid tissue surrounded by sclerotic bone; pain relieved by ASA
- d. Bone cysts-metaphysis of long bone

3. Others

- a. psychological-school phobias, hysteria (dxs of exclusion)
- b. Henoch-Schonlein purpura- arthralgias of lower extremities with typical rash
- c. "growing pains"- avoid this dx in the ED!

D. Adolescent- Teen Age Years (12-18)

1. Slipped Capital Femoral epiphysis

- a. most common teen hip problem, males > females 2:1; peak at puberty onset
- b. typical obese patient or tall thin with recent growth spurt
- c. more common in summer months, can be acute (< 3 wks) or chronic
- d. can be bilateral- up to 1/4 of adults with the problem
- e. actually the proximal femoral metaphysis displaces anteriorly and superiorly; this gives appearance of epiphysis being displaced posteriorly and inferiorly
- f. insidious pain, can be for months; localized to groin, knee, thigh or hip.
Absence of hip pain can lead to missed diagnosis. 8
- g. alteration of gait ensues, loss of internal rotation, atrophy of thigh
- h. AP and Frog Lateral views needed. Check Klein's lines (line along superior aspect of the femoral neck) which should intersect of all within epiphysis; in SCFE, line goes outside of epiphysis or at its edge
- I. make child non-weight bearing and to ortho ASAP for surgery

2. Bone Tumors

- a. Osteogenic sarcoma- highest in 2nd decade, males 1.5:1 > females, in metaphysis; present with localized pain and swelling worse at night
- b. Ewing's sarcoma- also 2nd decade, sexes equal, in diaphysis

3. Osgood -Schlatter's Disease

- a. apophysitis of tibial tuberosity- rest, ice and NSAID's

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