THE LIMPING CHILD

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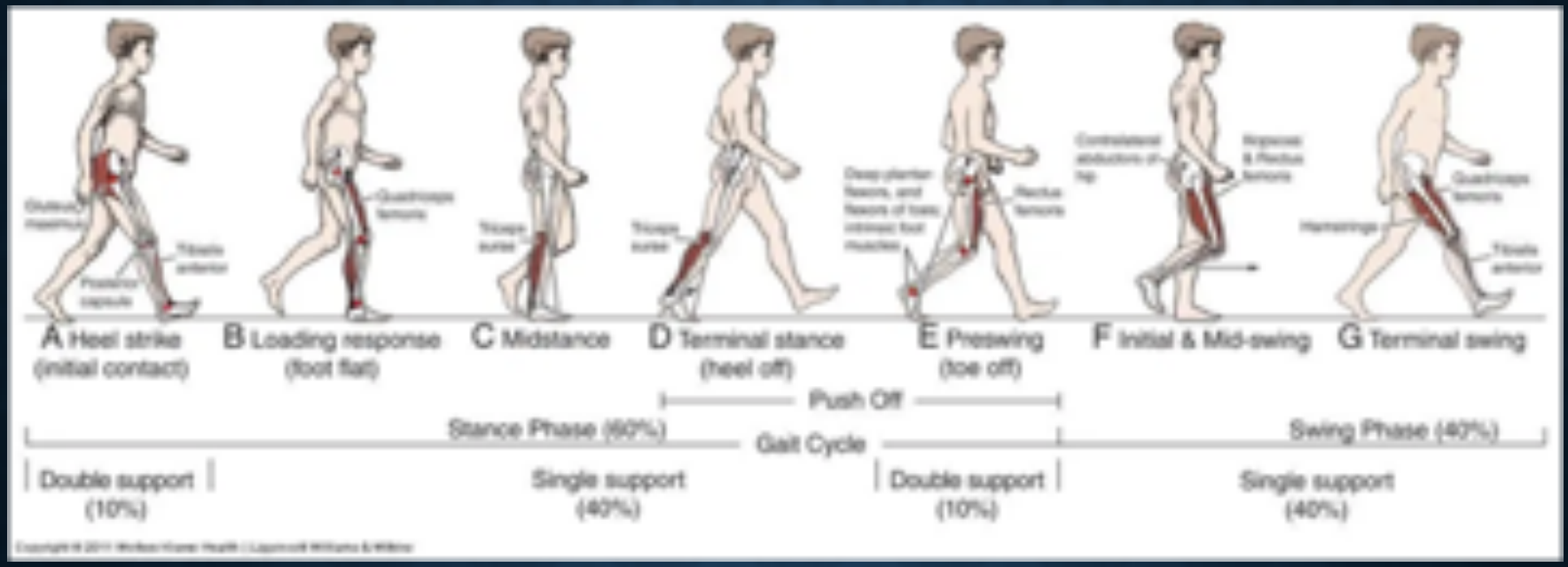


NORMAL GAIT

A limp is defined as any abnormal gait.

•PEM Playbook Podcast "Please, Just STOP Limping!" https://pemplaybook.org/podcast/please-just-stop-limping/

GAIT BY AGE

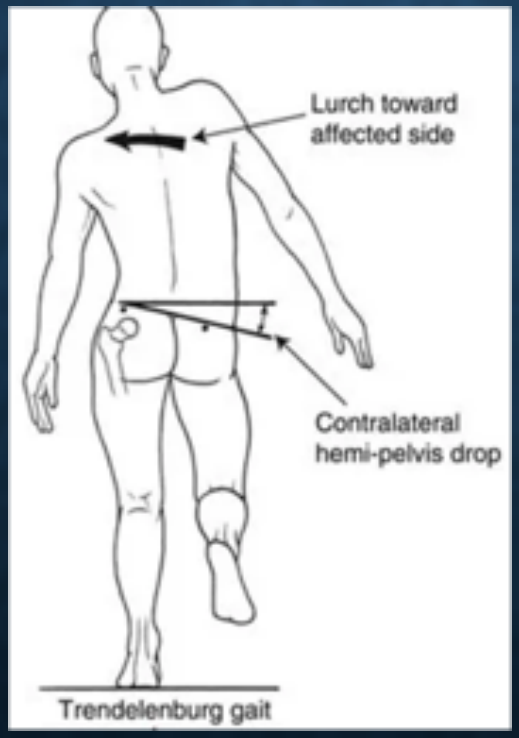
- Most children walk unassisted by age 15 months and run by age 18 months
- In children less than 3-3.5 years old, gait is characterized by…
  - Increased hip, knee, and ankle flexion
  - External rotation and wider spread of feet
  - Less time spent in the stance phase of the gait cycle
  - Increased step frequency but shorter strides
- By age 7, gait should be similar to the adult gait

COMMON TYPES OF LIMP

- Antalgic Gait:
  - Shortened stance phase on affected side
  - Decreases time spent bearing weight on affected side

- Circumduction gait
  - Stiff leg w/o knee or ankle flexion
  - Each step the foot makes a semi-circle

Trendelenburg gait



- Steppage Gait:
  - Foot drop
  - Hip and knee joints flex more during swing phase so that toes lift off ground as step is taken
- Equinus Gait:
  - Toe walking

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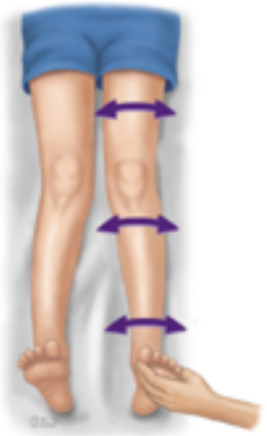
HISTORY

- Acute?
  - Think infectious or trauma
- Chronic?
- Affected joint(s)?
- Painful or painless?
- Are there systemic symptoms?
  - Think rheumatic, inflammatory, or neoplastic causes
- Preceding illness?
  - Think reactive arthritis, rheumatic fever, transient synovitis
- Travel history? Exposures?
  - Think Lyme Disease, dengue, malaria, yellow fever, leptospirosis, TB
- Weight bearing?
- Related trauma?

PHYSICAL

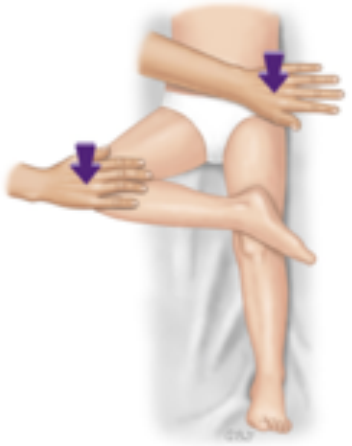
- Vital signs (fever, sepsis)
- Range of motion
- Sensory and motor function
- Gait evaluation
- Weight bearing status
- Palpable masses
- Localizing pain or point tenderness
- Exam of nearby joints
- Skin changes/rashes

Log roll test for evaluation of hip rotation



While keeping the leg straight, the foot is manipulated medially (internal rotation of the hip) and laterally (external rotation of the hip). Pain suggests inflammation, infection, or trauma. Synovitis tends to cause pain at extremes of rotation. Significant hip trauma or septic hip joint causes pain despite minimal rotation.

FABERE test (Patrick test, "figure of four" test)



The FABERE test (Patrick test or "figure of four" test) consists of **F**lexion of the hip and knee, with **AB**duction and **E**xternal **R**otation at the hip, so that the ankle of one leg is on top of the opposite knee (a figure four configuration). Force is applied downwards on the bent knee and the opposite hip, causing **E**xtension at the sacroiliac joint ipsilateral to the bent leg. Pain in the sacral region from pelvic torque during the FABERE test, in the absence of pain with passive motion of the hip joint, suggests discomfort arising from the sacroiliac joint.

Clark, M. Evaluation of the child with a limp. *UptoDate*. Jun 05 2019. https://www.uptodate.com/contents/evaluation-of-the-child-with-a-limp.

DIFFERENTIAL DIAGNOSIS FOR LIMP

Naranje S, Kelly DM, Sawyer JR. A Systematic Approach to the Evaluation of a Limping Child. *Am Fam Physician*. 2015;92(10):908-916.

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TRAUMATIC CAUSES OF LIMP

Toddler Fracture

- Not uncommonly seen in ED
- Toddlers aged 9mo-3yo learning to walk
- Associated with fall on planted foot or twisting injury; NOT assoc with NAT
- Often has unremarkable physical exam and delayed x-ray findings up to 2 weeks post injury

Initial x-ray can be NORMAL

Herman M, Martinek M. The Limping Child. *Pediatrics in Review*. 2015; 36(5):184-197.

OTHER TRAUMATIC CAUSES

- Fracture
- Contusion
- Sprain/strain
- Puncture wound/foreign body
- Ligamentous injury
- Neurovascular compromise
- Non-accidental trauma

Suspect NAT if:
- history is inconsistent amongst caregivers
- injury is inappropriate for developmental age
- multiple injuries in different stages of healing

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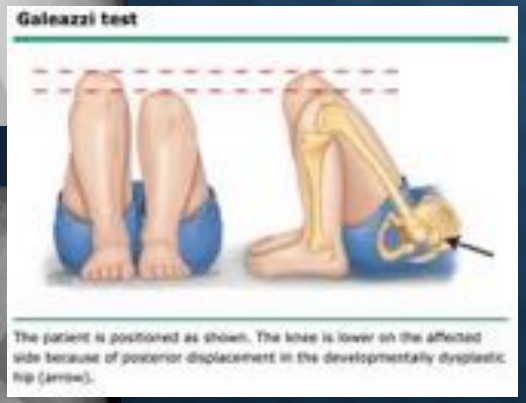
MUSCULOSKELETAL CAUSES OF LIMP



Abnormal Development:

- Developmental Dysplasia of the Hip
  - Suspect if leg-length discrepancy
- Slipped Capital Femoral Epiphysis (SCFE)
  - 50% of unstable SCFE can have avascular necrosis of hip
  - 1/3 have bilateral disease
  - Most often in 10-14 yr old obese males
  - Evaluate with frog lateral hip and AP hip xrays
- Legg-Calve-Perthes Disease
  - "idiopathic avascular necrosis of the femoral head"
  - Highest incidence in 6-8 yr old males
  - Exact pathophysiology unknown

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MUSCULOSKELETAL CAUSES OF LIMP

Overuse:

- Osgood-Schlatter Disease
  - Apophysitis of tibial tubercle
  - Typically seen in athletes 9-14 yrs old
  - Resolves around 14-15 yrs old with closure of tibial tubercle
- Sever Disease
  - Apophysitis of calcaneus
  - Typically seen in younger athletes 7-9 yrs old
  - More common if playing on hardwood floors or on cleats
- Sinding Larsen Johansson Syndrome
  - Apophysitis of the inferior patella at tendon attachment
  - Typically seen in athletes 9-14 yrs old
- IT Band Syndrome
- Patellofemoral Pain Syndrome
- Plantar Fasciitis
- Achilles Tendonitis

INFECTIOUS CAUSES OF LIMP: SEPTIC ARTHRITIS

Kocher Criteria

- Temperature >38.5 deg C
- Serum WBC > 12,000/uL
- ESR > 40 mm/hr
- Unable to ambulate

** to help differentiate from transient synovitis

***The greater the number of risk factors present, the greater the chance of septic arthritis.**

1 factor – 3% chance
2 factors – 40% chance
3 factors – 93% chance
4 factors – 99% chance

Septic hip can cause avascular necrosis within 1-2 days. Diagnose it early!

Confirm diagnosis of septic arthritis with joint aspiration:

- WBC > 50,000/uL
- PMN's > 75%
- Positive gram stain

Most common organisms:

Staph aureus
Strep pneumoniae
Group B Strep
Kingella kingae

OTHER INFECTIOUS CAUSES

- Reactive arthritis
- Lyme disease → - Can mimic septic joint. Send titers if in endemic area.
  - Joint most often affected is the knee.
- Tuberculosis of bone
- Rheumatic fever
- Osteomyelitis
- Discitis
- Sacroiliitis
- Deep soft-tissue infections
  - Abscess, myositis, pyomyositis, fasciitis

Best diagnosed with MRI.

Management:
- Empiric antibiotics
  - most commonly due to *Staph* and *Strep*
- Surgical debridement if extensive

NEOPLASTIC CAUSES OF LIMP

Benign

- Osteochondroma
  - Outgrowth of bone/cartilage at metaphysis of distal femur or proximal tibia
- Osteoid Osteoma
  - Usually involves cortex of long bones
  - More common in males 5-20 yrs old

Malignant

- Primary Bone Tumors
  - Ewing Sarcoma
  - Osteosarcoma
- Leukemia
- Lymphoma
- Neuroblastoma
- Bone metastases

Red flags: refusal to bear weight, constitutional symptoms eg fever, weight loss, hepatosplenomegaly, lymphadenopathy, bruising, pallor


< 30 years
> 30 years
FD
Ewing
EG
Osteoid
osteoma
NOF
SBC
Osteo
Chondroma
CMF
Enchond
ABC
Osteo
sarcoma
Metastasis
Myeloma
Lymphoma
Metastasis
Myeloma
HPT
Enchondroma
Chondrosarcoma

INFLAMMATORY & RHEUMATOLOGIC CAUSES OF LIMP

Juvenile Idiopathic Arthritis

- Most commonly affects knee
- Often rheumatoid factor negative
- Diagnosis:
  - Age < 16 yrs
  - Joint pain and/or stiffness
  - Joint swelling without effusion
  - Systemic symptoms (fatigue, fevers, loss of appetite, etc)
  - Symptoms for 6 weeks or more

OTHER INFLAMMATORY & RHEUMATOLOGIC CAUSES

- Henoch-Schonlein Purpura (HSP)
- Systemic Lupus Erythematosus
- Dermatomyositis

Differentiate rheumatologic causes from neoplastic with the absence of non-articular bone pains, easy bruising/bleeding from cytopenias, and palpable masses.

Fevers, anorexia, weight loss, and fatigue can be seen in both!

TRANSIENT (TOXIC) SYNOVITIS

- Found in 85% of limping children with hip pain, in absence of trauma
- Associated with viral infection 2-4 weeks prior to symptom onset
- In contrast to septic arthritis…
  - WBC, ESR, and CRP are normal/mildly elevated
  - Gram stain is negative
  - Nontoxic appearing
  - Improve with NSAIDs
- Treat with supportive care only

More Differential Diagnoses for Limp

Hematologic

- Sickle Cell Disease/Trait
  - Vaso-occlusive crisis
- Hemophilia/Hemarthrosis

Neurologic

- Cerebral palsy
- Neuromuscular disorders
- Tethered cord
- Herniated disc

Gastrointestinal

- Acute abdomen / Appendicitis (referred pain)
- Incarcerated inguinal hernia

Genitourinary

- Testicular/ovarian torsion
- Pelvic inflammatory disease

TABLE 1. **Age-specific Diagnosis in Patients Presenting With a Limp**

TODDLER (<3 YEARS)	CHILD (3–10 YEARS)	ADOLESCENT (>10 YEARS)
Developmental dysplasia of the hip	Legg-Calvé-Perthes disease	Slipped capital femoral epiphysis
Congenital limb deficiencies	Stress fractures	Legg-Calvé-Perthes disease
Neuromuscular abnormalities	Tumors	Juvenile idiopathic arthritis
Painful gait	Osteochondrosis	Overuse syndromes
Toddler fracture	Kohler disease	Osteochondrosis
Septic arthritis	Osteochondritis dissecans	Tumors
Reactive arthritis	Osgood-Schlatter disease	Osteochondritis dissecans
Transient synovitis	Transient synovitis	Stress fractures
Osteomyelitis	Osteomyelitis	Tarsal coalition
Foreign object in knee or foot	Leg-length discrepancy	Discoid meniscus

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FURTHER READING

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ADDITIONAL RESOURCES

- Clark, M. Evaluation of the child with a limp. *UptoDate*. Jun 05 2019. https://www.uptodate.com/contents/evaluation-of-the-child-with-a-limp.