

## Evaluating a Child Who Has a Limp

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A limp is a common problem in primary care and can be defined as any deviation from a normal gait pattern. It may arise from a process involving the spine, the pelvis, a lower extremity or a combination of these. The broad categories of pathology that cause a limp include trauma, infection, neoplasm, inflammatory process and developmental conditions. (See the Pathology Categories table on Page 2.) A limp often results in a referral to orthopedics or rheumatology.

### Diagnosis: Start With a Thorough History

As specialists, we are often asked about “screening labs” or imaging studies. However, it is best to start with a thorough history and physical exam and then determine if additional tests are necessary.

#### *When did the limp begin?*

If the limp is acute, the cause is likely to be an urgent problem, such as a trauma, infection or slipped capital femoral epiphysis (SCFE). If the answer is “since the child could walk,” developmental or neuromuscular issues should come to mind. If the limp is chronic, the differential diagnosis would broaden to include inflammatory arthritis associated with a rheumatic disease, subacute orthopedic conditions, or even neoplasms, although these are rare.

#### *Is the limp worsening or improving?*

Lyme arthritis tends to be episodic in its early stages, lasting only a few days at a time. On the other hand, septic arthritis is likely to worsen within hours, and Legg Calvé Perthes disease can develop over weeks.

#### *What are the characteristics of the pain?*

What part of the limb hurts? Keep in mind that hip pathology often causes pain localized to the knee, and spondylolisthesis pain can be felt in the hip. Is there any history of trauma? Are the symptoms worse at night or in the morning, during or after activities? Are there any associated fevers, chills or night sweats? Late in its course, for example, Kawasaki disease can be associated with arthritis. Most children who have juvenile idiopathic arthritis will not complain of pain.

### KEY INSIGHTS

- A careful history often reveals the source of potential pathology. For example, a family history of autoimmune disease or a patient’s history of a tick bite are both important findings that will direct your workup.
- Because the etiology of a limp is often obscure, the physical exam should be especially comprehensive: Evaluate the child’s gait, spine, hips, lower extremities and neurological responses.
- There are no pathognomonic lab tests to diagnose rheumatic diseases, and even a child who has multiple swollen joints can have completely normal lab work.

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## ■ Pathology Categories

| Trauma    | Infection        | Neoplasm      | Inflammatory                          | Developmental                              |
|-----------|------------------|---------------|---------------------------------------|--|
| Fracture  | Septic arthritis | Leukemia      | Many rheumatic conditions, including: | Orthopedic, such as:                       |
| Sprain    | Osteomyelitis    | Lymphoma      | • Lupus                               | • Legg Calvé Perthes disease               |
| Contusion | Cellulitis       | Benign        | • Arthritis                           | • Slipped capital femoral epiphysis (SCFE) |
|           | Lyme arthritis   | • Bone        | • Myositis                            | • Tarsal coalition                         |
|           | Discitis         | • Soft tissue | Enthesitis                            | Osteochondritis dissecans                  |
|           |                  | Malignant     | Kawasaki disease                      | Neuromuscular process, including:          |
|           |                  | • Bone        | Henoch-Schönlein purpura              | • Cerebral palsy                           |
|           |                  | • Soft tissue |                                       | • Metabolic muscle disease                 |

### *Can the child bear weight?*

Patients who have Lyme arthritis walk relatively comfortably, but patients who have septic arthritis most often cannot bear weight. Patients with amplified pain syndrome display an exaggerated limp or arrive in a wheelchair, but they may be coaxed to run. For younger children who cannot localize a painful site, observe whether they can crawl, which may help to localize the problem to below the knees.

### *What is the family history?*

Has the child or a family member been ill recently, including an upper respiratory illness or gastroenteritis? Keep in mind that few patients who have Lyme arthritis recall a tick bite. Unless specifically asked, most families will not mention a family history of such conditions as autoimmune disease, an inheritable metabolic myopathy, Crohn's disease, medial plica or discoid menisci. Other things to ask about include bleeding disorders, orthopedic conditions, chronic low back pain or neurological diseases.

## In-Depth Physical Examination

A thorough physical examination will localize the area of pathology further.

**Observe the child's gait.** In an antalgic gait, less time is spent in stance phase on the affected leg. In a Trendelenburg gait, the torso shifts over the affected limb in stance phase. A stiff gait occurs in conditions such as discitis, in which movement exacerbates symptoms.

During the **neurologic evaluation**, look for evidence of altered motor or sensation, asymmetric reflexes or clonus.

A **spine evaluation** should include palpation of the spine, paraspinal muscles and sacroiliac (SI) joints. Include forward bending and spinal extension, as well as a straight leg raise. A FABER test (hip flexion, abduction, external rotation) may provoke pain in inflamed SI joints. Palpate the iliac crests and the insertion of the gluteal muscles for tender points due to enthesitis.

A **complete hip evaluation** is essential. Palpate for any areas of tenderness, swelling or bruising. Evaluate for symmetry of motion in flexion, extension, internal and external rotation, and abduction. Asymmetry may indicate underlying hip pathology. Does range of motion incite pain? What is the hip's preferred resting position? A resting position of hip flexion and external rotation can indicate compensation for fluid in the hip capsule. Evaluate for differences in limb length with a Galeazzi test. Many conditions causing hip pain are provoked with range of motion, including a septic hip, early Legg Calvé Perthes disease, SCFE or transient synovitis. Typically, children who have transient synovitis tolerate greater ranges of motion than children with septic arthritis.

When examining an older child who has acute hip or knee pain and is unable to bear weight, use extreme caution in checking the hip's range of motion until radiographs are obtained. This may be the presentation of an unstable SCFE.

In the **lower extremities**, evaluate all joints for effusion and range of motion, and check all joints and bones for tenderness to palpation, swelling and warmth. Use the well leg for a comparison. Look behind the knee for a Baker’s cyst, and compare the calf sizes for a possible ruptured Baker’s cyst. Palpate around the patellar tendon and its insertion. Measure the leg lengths to look for discrepancy and notice any muscle atrophy, which suggests a chronic process like juvenile idiopathic arthritis or intrauterine stroke.

When evaluating toes, use the number system, comparing the left fifth toe to the right fifth toe and so on, to best detect a discrepancy. Squeeze the metatarsal heads gently but firmly one by one, as well as the rim of the calcaneus and the back of the heel to detect enthesitis. Remember to look under the feet for big warts and embedded foreign bodies.

### Diagnostic Testing

Before calling for imaging or a referral, look for other swollen joints, even in distal interphalangeal joints. Then do a full body exam for signs of systemic disease, such as hair loss, rashes, oral ulcers, enthesitis, abdominal tenderness, fever, heart murmur, muscle weakness or abnormal reflexes.

Unless septic arthritis is suspected in multiple joints, call a rheumatologist when more than one swollen joint is found. Also check the child’s pupils for irregularity, which might indicate chronic uveitis.

### Imaging

If a patient who experiences an acute trauma has a swollen joint, request the appropriate radiographs.

**Radiographs** of the affected area may help identify fracture, joint effusion or neoplasm. Remember to image the hip if knee symptoms do not localize solely to the knee, because hip pathology often masquerades as knee pain. Obtain AP and frog lateral pelvic films, unless there is suspicion of an unstable SCFE. In that case, request a cross table lateral hip X-ray to prevent further slippage. If an area of suspected pathology is unclear, consider imaging the contralateral limb for comparison. Remember that pediatric physes are common areas of injury.

An **ultrasound** can be a quick, noninvasive tool for identifying fluid on the hip capsule. Radiologists can perform an ultrasound-guided aspiration of hip fluid.

Further information about pathology can be obtained using advanced imaging techniques (**CT scans, bone scans and MRIs**). CT scans are most helpful in diagnosing bony conditions such as a fracture or structural abnormality. An MRI is more helpful in evaluating soft tissues or inflammation in bone, such as that seen in infection or neoplasm. Use IV contrast to evaluate synovitis, distinguish fluid from tissue, and visualize lesions like hemangiomas or vascular malformations.

### Laboratory Tests

If **infection is a consideration**, order a CBC with differential, CRP and ESR. CRP is a sensitive, early reactive test, which commonly shows elevated levels in infectious processes earlier than an ESR does.

The WBC is often elevated in infectious processes<sup>1</sup>. Kocher et al. published criteria to differentiate between a septic hip and transient synovitis of the hip (see Kocher Criteria). A low WBC or platelet count raises suspicion for leukemia, prompting a peripheral smear.

#### ■ Kocher Criteria

| Kocher Criteria Factor                    | Likelihood of Septic Arthritis |
|---|--------------------------------|
| Inability to bear weight on affected side | 1 positive: 3%                 |
| ESR > 40                                  | 2 positive: 40%                |
| WBC > 12,000                              | 3 positive: 93%                |
| Fever                                     | 4 positive: 99%                |

Remember, no pathognomonic lab tests exist to diagnose rheumatic diseases, and even a child who has multiple swollen joints can have completely normal lab work. If systemic illness is suspected, start with ALT, AST, urinalysis, creatinine, ANA and double-stranded DNA evaluations. If the child lives in an area of the country endemic for Lyme disease, also obtain a Lyme titer.

If an infectious process is suspected, you or a specialist may consider a joint aspiration. The joint aspirate should be sent for cell count, gram stain, and aerobic and anaerobic cultures. In older children, gonorrhea must be suspected, and a culture should be prepared for specific evaluation.

**infection is not a concern**, then a joint tap is unnecessary. Pediatric rheumatologists usually tap a joint only if we are considering a certain diagnosis, such as intracranial hemangioma, or if we want to treat the child with steroid injection. Otherwise, tapping a joint yields little information and often is traumatic for younger children.

## **Conclusion**

A limp may indicate trauma, infection, inflammation, neoplasm or a developmental condition. Arriving at a diagnosis will require a thorough history, a careful physical examination (especially of the lower extremities), and selective imaging and laboratory testing. Determining the broad pathology will help in deciding whether to treat or to refer the child to an orthopedist or rheumatologist.

## **When Is a Referral Recommended?**

A child who has a limp almost always has an underlying medical condition that will require treatment. Please consult our pediatric orthopedic surgeons if your patient appears to have an acute orthopedic condition (e.g., trauma or cannot bear weight and has fever and chills) or a chronic condition. If your exam points to an inflammatory or rheumatic condition, please contact our Rheumatology department.

We welcome your questions and requests for consultation.

Boyer MS, Zurakowski D, Kasser JR. Differentiating between septic arthritis and transient synovitis of the hip in children: An evidence-based clinical prediction algorithm. *J Bone Joint Surg Am.* 1999;81:1662-70.



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Akin received her medical degree from Istanbul University in Turkey. She completed her internship and residency in pediatrics at Massachusetts General Hospital in Boston, Mass. She was a postdoctoral fellow in pediatric rheumatology at Tufts University's Floating Hospital for Children in Boston. She also was a research fellow at Beth Israel Hospital at Harvard Medical School.

### **Alison Schiffern, M.D.**

Alison Schiffern, M.D., is a pediatric orthopedic surgeon who focuses on treating conditions such as fractures, limb deformity, developmental dysplasia of the hip, clubfoot, and other bone and soft tissue conditions. She also treats patients who have a spectrum of neuromuscular disorders.

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She has a special interest in orthopedic outreach programs in countries with limited resources and has spent time in Ghana on multiple occasions.

## A Pediatric PERSPECTIVE

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## NEWS & NOTES

### *Combined Pediatric and Adult Level I Trauma Center Serves Families*

Gillette Children's Specialty Healthcare and Regions Hospital have one of the few Level I trauma centers in the United States that treat pediatric and adult patients under one roof. We offer families the highest level of trauma care, streamlined care coordination, and an extra measure of comfort during a stressful time.

### *Complex Movement Disorders Clinic Launched*

Gillette holds a specialty clinic in St. Paul every third Tuesday of the month to evaluate children who have primary or secondary dystonias (e.g., hyperkinetic movements, athetosis, rigidity, tardive dyskinesia). Patients who are referred to our clinic meet with a neurologist and, depending on the patient's condition, will see an interdisciplinary team that includes pediatric neurosurgeons, pediatric rehabilitation specialists and therapists.

**To refer a patient, call One-Call Access: 651-325-2200 or 855-325-2200 (toll-free).**

### *Gillette and Children's Hospitals and Clinics of Minnesota - St. Paul Campus Collaborate on Neuro-NICU*

Gillette and Children's Hospitals - St. Paul formalized a plan to provide care for patients in the NICU who have neurological conditions. Gillette's pediatric neurologists and Children's neonatologists will work together to evaluate and treat infants at Children's - St. Paul and plan appropriate services for long-term management.