



Pitfalls in Pediatric Orthopedic Trauma: The Limping Child

Disorders that cause limping vary in children of different ages. This article will examine disorders leading to gait disturbances in three different age groups—one to three years, four to 10 years, and adolescents aged 11 to 15 years.

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The limping child may present a significant challenge to the physician. In order to arrive at the correct diagnosis, the clinician must approach each patient in an organized fashion.

In general, disorders that cause limping vary from age group to age group. This article will examine three different age groups relative to the

disorders leading to gait disturbances. The three groups are toddlers (ages one to three years), children (ages four to 10 years), and adolescents (ages 11 to 15 years).

A thorough history taken by the clinician is important in evaluating the limping child. The history may allow for an early diagnosis, perhaps even before the physical examination is performed. Most of the conditions described below usually require an orthopedic surgical consultation.



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The Limping Toddler (Ages 1 to 3 Years)

Of the three age groups mentioned, toddlers probably offer the most challenges for clinicians.¹ A

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Limited, but not painful, range of motion of the knee and ankle, hyperreflexia and clonus provide confirmation of a neurologic disorder, such as cerebral palsy.

reliable history is difficult to obtain, even when taken from the child's parents.

The physical examination should be complete and undertaken with the child gowned and barefoot. Check the gait, allowing the child to walk freely with his/her parents. Lack of spine motion or limitation of joint range of motion is usually quickly evident. Tenderness to palpation, warmth, redness and swelling of extremity are all helpful in narrowing the differential diagnosis.

I. Infection versus non-infection. This has to be differentiated in every age group. Transient syn-

ovitis and septic arthritis often must be differentiated from one another. Although both conditions produce a limp in the toddler because of pain, patients who have septic arthritis are usually more irritable and frequently refuse to walk. Transient synovitis—probably the most common cause of lower extremity joint pain—has a favorable outcome, whereas, septic arthritis, if untreated, has the potential for significant complications.

(a) *Septic arthritis/osteomyelitis.* These conditions usually present with a rapid onset of joint or bone pain, usually progress to a febrile systemic

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illness and lead to the toddler's refusal to use the extremity. There may be a history of mild trauma or concurrent illness or infection. On examination, the joint is held immobile, may be swollen and tender to palpation and weight bearing is painful. Range of motion of the affected joint causes obvious pain to the child. X-rays are usually negative, except for soft tissue swelling in the acute phase and radiographic bone changes, which are seen only after seven to 10 days of onset of the untreated infection. The white blood cell count (WBC), C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) are usually elevated. Blood cultures always should be drawn, as they will identify the offending organism in up to 50% of patients with septic arthritis or osteomyelitis. Occasionally, bone scans are helpful to localize the infection. Aspiration of the joint is necessary to confirm the diagnosis and identify the bacterial organism. An orthopedic surgeon and an infectious disease specialist should be consulted before antibiotics are started.

(b) *Transient (toxic) synovitis*. Transient synovitis also presents as an acute onset of joint pain, with limp and restricted joint range of motion in

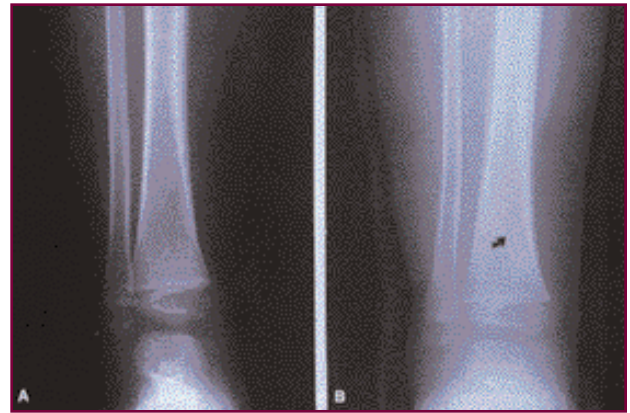


Figure 1. a) Initial radiograph reveals no evidence of a fracture. b) Two weeks later, some new periosteal bone formation (callus) is present confirming diagnosis of a spiral tibial fracture.

the older toddler. Transient synovitis is most common in children between three and eight years of age. In contrast to septic arthritis, children with transient synovitis usually do not have fever and systemic illness. The clinical symptoms generally show a gradual and complete resolution over several days to weeks, usually averaging 10 days.



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Figure 2. An antero-posterior (AP) pelvic x-ray reveals an obvious left dislocated hip.

It is during the acute phase, however, that the clinician must differentiate between septic arthritis and transient synovitis. The finding during physical examination may be similar, but children with septic arthritis are usually more irritable. Temperature is never greater than 38° C. ESR, WBC, CRP are usually within the normal ranges. The goals of

Acute leukemia, the most common neoplasm in children under 16 years of age, has a peak incidence between the ages of two and five. Musculoskeletal complaints are a presenting feature in 20% of children with this disorder.

treatment are to hasten the recovery of the underlying inflammatory synovitis, which respond to activity restriction, bedrest, non-weight bearing and oral nonsteroidal anti-inflammatory drugs (NSAIDs).

(c) *Diskitis (Infectious Spondylitis)*. The toddler may have difficulty walking or may have progressed to the point where he/she refuses to walk.



Figure 3. Knee x-rays reveal white thick metaphyseal bands on both distal femurs and proximal tibias suggestive of leukemia.

During the evaluation, if the toddler is asked to pick up an object from the floor, the child will either refuse or will bend only at the hips while holding the lower back straight to avoid motion of the spine. The toddler may not appear ill, but in over 80% of cases, the ESR will be elevated. Blood cultures may be positive and the organism most commonly encountered is *Staphylococcus aureus*. Early radiographs will be normal. A bone scan is helpful in confirming the preliminary diagnosis and assists in localizing the infection. The treatment of choice is systemic antibiotics, as this leads to a more rapid resolution of symptoms than oral antibiotics.

II. Toddler's fracture. A torsion type of injury to the foot may produce a spiral fracture of the tibia without a fibular fracture. There may be no history of recognized trauma, yet the child presents with a limp, or refuses to bear weight. Radiographs may demonstrate a spiral fracture or may be unremarkable (Figure 1).² Follow-up radiographs one to two weeks later will reveal subperiosteal new bone formation. If a fracture is suspected, a protective cast may be applied for a period of three weeks.

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III. Neurologic disorder (Cerebral Palsy). Very mild cerebral palsy is the most common neurologic disorder that leads to asymptomatic limping in the toddler. A thorough prenatal, perinatal, and post-natal history is needed. A thorough examination will help to differentiate the problem. Limited, but not painful, range of motion of the knee and ankle, hyperreflexia and clonus provide confirmation. A referral to a pediatric orthopedist and neurologist is in order.

IV. Developmental dislocation of the hip. If this condition is not picked up in the newborn period, it will produce a painless limp in toddlers. Examination of the toddler's gait will demonstrate a limp, a short leg, one-sided toe-walking, or, if bilateral, a sway-back appearance accompanied by a waddle. On supine examination, the toddler's hip has a limited amount of abduction when compared to the normal side. After the age of six months, a plain anteroposterior (AP) radiograph of the pelvis easily confirms the diagnosis (Figure 2).

V. Juvenile chronic arthritis (Monoarticular - Pauciarticular). This is the most common subgroup of juvenile arthritis. It usually is present around the age of two years, and patients have a

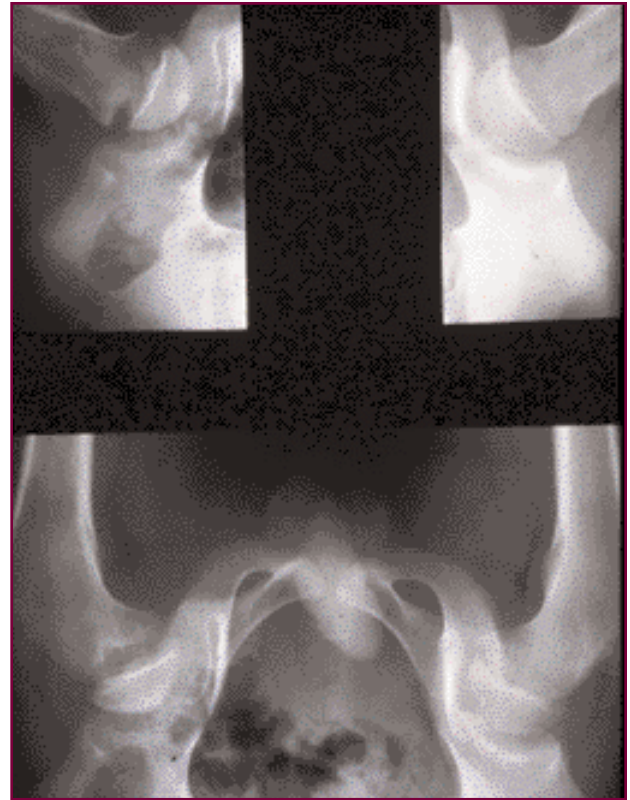


Figure 4. AP and frog-leg pelvis reveals a smaller and denser left femoral head compatible with early Legg-Calvé Perthes disease.

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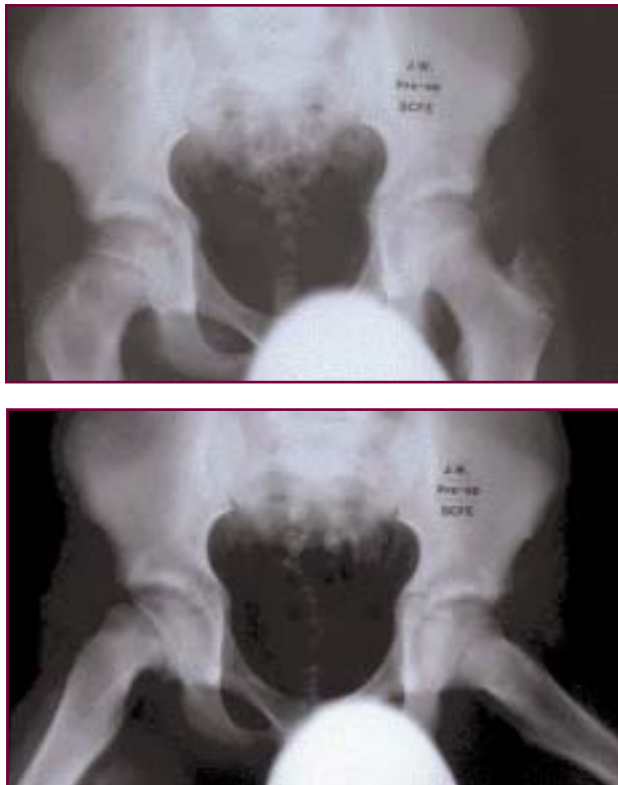


Figure 5. a) AP pelvic x-ray reveals subtle right slipped femoral capital epiphysis (SCFE). b) Frog-leg pelvic x-ray on the same patient demonstrates a more obvious slip of the femoral epiphysis.

mildly painful limp. Girls are four times more likely to be affected than boys. Symptoms develop slowly and are accompanied by mild swelling, warmth and restriction of joint range of motion. The subtalar joint, ankle, or knee are commonly involved in the lower extremity. Laboratory evaluation, including ESR, WBC and rheumatoid factors may be unremarkable. If swelling is persistent, a referral to a children's rheumatologist should be made.

VI. Neoplasms. Bone tumors are uncommon and, therefore, are rarely responsible for a toddler's limp. If present, plain radiographs may often identify the abnormality. Two neoplasms,

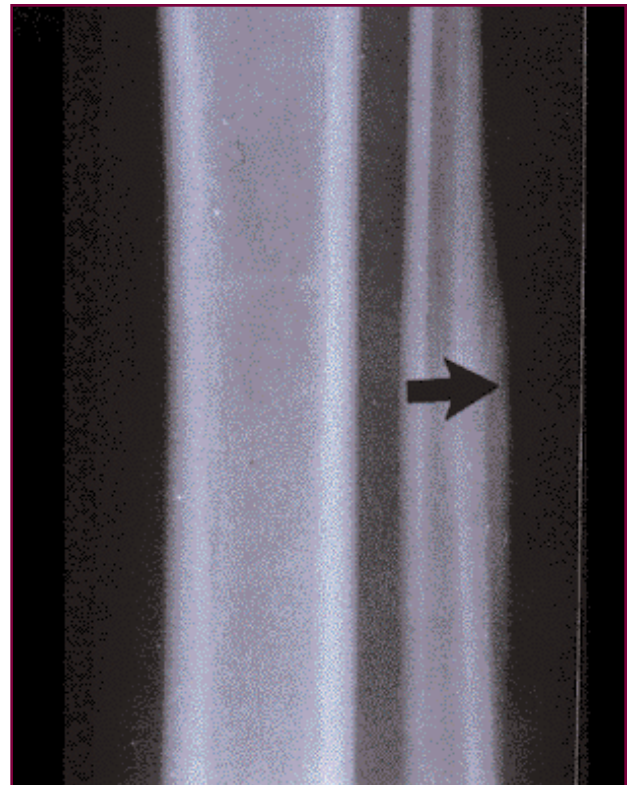


Figure 6. X-rays of the tibia and fibula demonstrates periosteal reaction (callus) over the lateral aspect of the fibula. This most likely represents a healing stress fracture.

however, may be unremarkable on initial radiographic evaluation. Leukemia and osteoid osteoma have been shown to be responsible for painful limps in toddlers.

(a) Leukemia. Acute leukemia, the most common neoplasm in children under 16 years of age, has a peak incidence between the ages of two and five. Musculoskeletal complaints are a presenting feature in 20% of children with this disorder.³ Bone pain in the lower extremities may be described as discomfort in an adjacent joint. Generalized symptoms should be recognized, which include lethargy, pallor, bruising, fever and bleeding. Furthermore, appreciation of skin bruising

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Figure 7. a) Oblique radiograph of a normal foot reveals a space between the calcaneus and navicular. b) In a calcaneonavicular coalition, the oblique radiograph reveals an osseous connection between these two bones.

ing and hepatosplenomegaly are helpful in making the diagnosis. With the exception of bruising, bleeding and hepatosplenomegaly, the clinical picture may be similar to that of septic arthritis, osteomyelitis, cellulitis or arthritis. Leukemia, therefore, should always be included in the differential diagnosis of these other disorders. Laboratory evaluation may reveal elevated ESR and peripheral leukocyte counts. The earliest radi-

ographic findings may be lucent metaphyseal bands (Figure 3). Bone scans may be normal.

(b) *Osteoid osteomas* are uncommon in children younger than five years of age. This diagnosis is extremely difficult to make in toddlers who are just learning to walk. Although pain is the most frequent clinical manifestation, limping is common. If radiographs are negative, bone scans provide considerable guidance in identifying the lesion.



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The Limping Child (Ages 4 to 10 Years)

Older children can communicate better than toddlers and usually are more co-operative during an examination and may assist the clinician in evaluating the problem. Complaints by children in this age group should be taken seriously, because these children usually are more interested in play than they are in secondary gains. Periodically, parents describe a situation in which their child complains of aching in the legs, generally during the evening or night. The pain responds to a rubdown and infrequently requires medication. Prior to reassuring the parents that this represents benign "growing pains," the child should be evaluated in order to avoid missing an underlying disorder. All of the disorders mentioned for toddlers must be kept in mind when evaluating an older limping child.

I. Transient synovitis. Transient synovitis is seen most commonly in the three- to eight-years-of-age group and probably is responsible for the majority of limping due to an irritable joint. The most important aspect is to differentiate this condition from a septic process.

II.) Legg-Calvé Perthes disease (LCPD) is an idiopathic avascular necrosis of the child's hip. LCPD is most common in children aged four to eight years, although older children also may be affected. Boys are involved four to five times more frequently than girls. These children present with limping, but complaints of hip pain are infrequent. If pain is present, it may be described in the hip, groin, thigh, or knee, and usually increases following activity.

A physical examination quickly localizes the problem to the hip, because internal rotation and abduction is limited and causes discomfort to the child. The earliest radiographic sign is an increased density of the femoral head (Figure 4), and collapse and fragmentation of the femoral epi-

physis is seen later in the course of the disease. This condition is not an emergency, but referral to a pediatric orthopedist within three to four weeks is necessary.

III. Sever's disease/Calcaneus apophysitis. Sever's disease or calcaneal apophysitis is an inflammation of the skeletal immature calcaneus. This type of heel pain classically occurs in the eight- to 10-year-old age group in girls, and in boys aged 10 to 12 years. This presents as a chronic, intermittent pain related to sports, which involves jumping or running. It rarely hurts while the child is skating or skiing, where the heel is immobile. The pain is located along the medial aspect of the posterior part of the heel. The range of motion of the ankle is usually normal. Treatment consists of ice, rest, limitation of activities and cushion heel inserts. This process is self-limiting.

The Limping Adolescent (Ages 11 to 15 Years)

The adolescent with a limp usually can provide an accurate history of the problem, however, the symptoms that are described can be minimized if, for example, the patient wants to return to playing sports quickly. Likewise, the symptoms may be over emphasized if the patient wishes to avoid physical activities, such as gym class. Once again, many of the disorders already mentioned must be taken into consideration when evaluating the limping adolescent, however, several other disorders that are more common in the adolescent age group should not be overlooked. These include slipped capital femoral epiphysis, overuse syndromes, osteochondritis dissecans and tarsal coalition.

I. Slipped capital femoral epiphysis (SCFE) is a disorder in which the epiphysis becomes posteriorly displaced on the femoral neck. SCFE is believed to be the most common hip disorder occurring in ado-

lescence. Clinically, boys present around the age of 14 years and girls around 12 years of age. Most often, adolescents who generally are overweight and physically immature describe a mild, but constant, pain in the hip, groin, thigh, or knee. The duration of symptoms is usually several months, but occasionally, the adolescent may present with acute excessive pain and actually is unable to walk at all. Always be suspicious of a hip problem that presents as knee pain. Quite often, hip pain is referred to the knee.

On examination, as mentioned, the adolescent is generally overweight and physically immature for his/her age. Range of motion of the hip is limited in internal rotation and abduction. As the lower extremity is flexed at the hip, it often assumes an externally rotated appearance. AP radiographic views of the pelvis may miss the subtle slip, so a view of a frog leg pelvis or a true lateral of the hip will give the clinician a better chance to make the diagnosis (Figure 5). A referral to an orthopedic surgeon is mandatory and should be done as soon as possible.

II. Overuse syndromes. As adolescents become more active in organized sports, overuse injuries occur with increasing frequency. These syndromes typically present with pain, but on rare occasions, also present as a limp. The knee is the most common site for this. Patellar tendonitis or apophysitis of the tibial tubercle (Osgood-Schlatter disease) cause persistent pain. Point tenderness to palpation is helpful in confirming these disorders. Rest, ice and anti-inflammatory medicines are needed in the acute stage.

Stress fractures are seen in patients whose activities lead to repetitive loading of the lower extremities. The tibia and fibula are most susceptible. Radiographs may demonstrate the subtle sclerotic line or periosteal reaction (Figure 6), or they may be normal. If suspicion of a stress fracture is high, a bone scan is very useful in confirming the diagnosis. Treatment consists of rest in the

acute phase with possible immobilization in a cast of the extremity involved.

III. Osteochondritis dissecans is a condition in which a portion of subchondral bone within a joint becomes avascular. The etiology is unclear. This condition is most common in the adolescent age group, and typically presents with pain, but it also can, on rare occasions, present with a limp. The knee is affected most, but the hip and ankle can also be involved. Radiographically, a "tunnel" view of the knee allows the defect to be seen more clearly. Classically, it is located on the lateral side of the medial femoral condyle. Patients with this condition should be referred to an orthopedic surgeon within three weeks.

IV. Tarsal coalitions. Tarsal coalition is a condition in which certain tarsal bones become fused with each other, most commonly the calcaneus with the navicular or the calcaneus with the talus. The adolescent presents with a rigid flatfoot, and the subtalar joint motion (inversion, eversion) is markedly restricted and painful. X-rays (oblique and Harris views of feet) are necessary to show the coalition (Figure 7). Referral to a pediatric orthopaedic surgeon is necessary. [CME](#)

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Suggested Readings

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