PedsCases Podcast Scripts

This is a text version of a podcast from Pedscases.com on "Evaluation of a Limp." These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Evaluation of a Limp

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Introduction

This podcast addresses the evaluation of limp in children. Limps are a common presentation to both doctor's offices and emergency rooms.

In the first part of this podcast, we will help you develop an approach to the evaluation of limp. We will then go through a brief overview of some of the common and more serious causes of limp in children.

Limp (general)

Let's start with the basics – what is a limp? Simply put, a limp is any change in the normal walking gait. Remember that the gait cycle is composed of two phases – stance and swing. In the stance phase, the foot is in contact with the ground. In the swing phase, the foot is in the air.

Limps can be either painful or painless. Pain results in what we call an antalgic limp. The stance phase is shortened in antalgic limps as a means of decreasing the pain in the affected leg.

Developing an Approach

The differential diagnosis of a limp in a child is quite long. Potential culprits include trauma, infections, inflammatory processes, vascular conditions, degenerative conditions, congenital anomalies, and neoplasms. Without an organized approach, it can turn into a confusing laundry list.

A thorough history and physical exam, supplemented by a few select investigations should allow you differentiate the common causes of limp. Over the next few sections, we will cover the history, physical exam as well as laboratory investigations and imaging studies.

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History

There are several key questions to ask on the history.

Let's start with questions regarding the limp itself. You should ask when it started and whether it is getting worse. Find out to what extent the child is able to carry on which normal activities- like walking, running- and whether the limp is worse in the morning or after naps, after activity or later in the day.

Try to determine if there is pain with the limp. If so, find out if the pain is continuous or intermittent and especially if it wakes the child from sleep. If the child is old enough to tell you, try to localize the pain and ask about the quality of the pain - sharp or dull and aching.

Next ask about systemic symptoms. Has the child had a fever, night sweats, loss of appetite or weight loss? The presence of these symptoms would raise your suspicion for an infection or neoplasm. Ask about rashes as some inflammatory diseases like Henoch Schonlein purpura or systemic onset juvenile idiopathic arthritis can be associated with skin findings. Also ask if there have been any recent illnesses, especially upper respiratory tract infections, sore throat, diarrhea, that might have triggered a reactive inflammation.

Finally, is there a history of injury or a pattern of overuse that might explain the limp?

The child's age is a critically important historical feature. Certain causes of limp are more likely in particular age groups.

Physical Exam

A key part of the examination is to assess the child's gait and examine the limbs.

When evaluating the child's gait, they should be barefoot and with as much of the legs exposed as possible. Have the child walk in an open area like a corridor so that you can observe several gait cycles. While observing the child, systematically focus on each component of stance and swing and then the extremities.

After observing the gait, you now want to try to find out where the limp originates. Examine each limb carefully, paying attention to areas of asymmetry, Look for any areas of redness, swelling, warmth, bruising or deformity. Each joint should be evaluated for pain, range of motion, guarding or discomfort with movement. Palpate the legs to locate the point of greatest tenderness. Remember referred pain- and carefully examine the joints adjacent to the areas of pain. This is especially important with hip conditions in which the child may report pain in the thigh or knee.

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A good general physical examination is also important checking for rash, hepatosplenomegaly, lymphadenopathy, and other systemic abnormalities. Don't forget that serious spinal cord and abdominal pathology can also sometimes be the cause of a limp.

Investigations
After you have completed your history and physical examination, you should have a working differential diagnosis. Appropriate diagnostic investigations may then be selected to help confirm or rule out the likely possibilities.

A complete blood count and differential, erythrocyte sedimentation rate and C-reactive protein level can be done if you suspect an infection or inflammatory disease, although abnormalities are often non-specific.

If you suspect septic arthritis, then a joint aspiration should be done urgently and sent for gram stain, culture and cell count.

Other investigations would depend on the specific conditions you are trying to rule in or out.

Imaging Studies
Imaging studies can be helpful in many causes of limp, especially if there is a history of injury. You should order AP and lateral radiographs of the relevant areas. Don't forget to image the hip in a child who presents with knee pain.

Additional imaging may be considered in certain situations. Bone scans can detect changes in bone metabolic activity that can occur with neoplasm, bone infection or avascular necrosis, and may show abnormalities in these conditions 10 to 14 days sooner than plain films.

Magnetic resonance imaging may also be helpful in some cases

Specific Causes of Limp

We will now briefly discuss some specific causes of limp. We will cover their historical features, physical findings and their typical laboratory and radiographic findings. We will also briefly address treatment.

Transient Synovitis and Benign Causes
Transient synovitis is the most common cause of hip pain combined with limp in children. It is more frequent in boys and typically affects children aged 2 to 9 years. It often follows a viral upper respiratory infection. Children with Transient synovitis are usually afebrile, systemically well and have onset of limp over 1 to 2 days. On examination, they have limitation in internal rotation of the hip. Transient synovitis may occur in other joints as well but the hip is the most common. The symptoms generally resolve without treatment over

several days. Treatment consists of rest. In some cases, NSAIDs and mild traction may be helpful.

Other common and benign causes of limp are blisters, poorly fitting shoes.

Infections: Septic Arthritis

Bacterial bone and joint infections are not common but they have potential to cause significant disability if not recognized promptly and treated appropriately. Both septic arthritis and osteomyelitis are more common in infants and toddlers, but can be seen at any age.

Children with Septic arthritis are almost always febrile. They have a rapid onset of symptoms with limp progressing to an outright refusal to walk. The affected joint is red, warm, swollen and painful to move. Sometimes it may be difficult to differentiate septic arthritis from transient synovitis, so it is important to remember that the following *5* factors are predictive of septic arthritis:

1. Outright refusal to bear weight on the affected leg
2. Oral temperature greater than 38.5 Celsius
3. ESR higher than 40 mm/hr
4. Peripheral white blood cell count greater than $12x10^9/L$
5. CRP level greater than 20.0mg/L

If septic arthritis is suspected, a joint aspiration must be performed to make the diagnosis. The synovial fluid in cases of septic arthritis will contain high white blood cells counts, with greater than 75% polymorphonuclear neutrophils (PMNs). The fluid should also be sent for gram stain and culture.

Remember: acute onset of fever, refusal to walk and joint swelling must be considered a case of septic arthritis until proven otherwise.

Treatment of septic arthritis consists of removal of the septic joint fluid and antimicrobial therapy. Orthopedics should be consulted immediately to perform drainage of the joint, which is both diagnostic and therapeutic. Depending on the joint involved, either surgical drainage or repeated aspirations may be performed. As soon as blood and joint fluid is obtained for culture, intravenous antimicrobial therapy should be started. The initial choice of antibiotic is determined by the child's age and gram stain results, and can be modified once the culture results are available. A typical course of antibiotic therapy is 3 to 6 weeks.

Infections: Osteomyelltis

Osteomyelitis of the lower extremity is another serious infection that you must exclude when evaluating a child with a limp or refusal to walk. Osteomyelitis is an infection of the bone. In children, it almost always results from hematogenous spread. Long bones are most commonly involved, especially the distal femoral and proximal tibial metaphyses.

These children tend to present with fever and limp or refusal to bear weight. If the child is cooperative, you can identify pain on palpation of the area of bone involved. Redness, warmth and swelling are less common.

Children with osteomyelitis may have elevated White blood cell counts, ESR and CRP, but this is not universal. Blood cultures may be positive. Plain X-rays are often normal initially as the classic lytic changes are not seen for 10 to 14 days. A bone scan or MRI is much more sensitive early on and should be performed if the diagnosis of osteomyelitis is suspected. It may also be possible to recover the pathogen from a needle aspiration or biopsy of the suspected area of infection if the diagnosis is still in question.

Osteomyelitis is treated with initially with intravenous antimicrobials which can be switched to oral once the child has improved clinically. A typical course of therapy is 6 weeks. Surgical therapy to drain the infected bone may be required in some cases.

Legg-Calvé Perthes Disease (Avascular Necrosis of the Hip)

Legg-Calvé Perthes disease, also known as avascular necrosis of the hip, can cause a limp or knee pain in children between the ages of 2 and 12. The most common symptom is persistent pain. Hip movement is limited, especially internal rotation, and there can be muscle spasm.

Laboratory tests are normal, including any studies of joint aspirates.

Legg-Calvé Perthes disease can be diagnosed on AP and frog leg view radiographs of the hips. Widening of the joint space may be the only abnormality initially, but over several weeks, the findings progress with irregularity of the bone in the femoral head followed by collapse of the femoral head. Bone scan can demonstrate the decreased blood flow, and MRI may also be useful in diagnosis.

Legg-Calvé Perthes disease typically runs its course over 2 years. Although there is no treatment which improves blood flow, patients should be referred to orthopedics. Management is to maintain the position of the femoral head within the acetabulum and preserve range of motion. Reshaping and remodelling of the femoral head will continue while the child is growing so the prognosis is best for children diagnosed at a younger age.

Slipped Capital Femoral Epiphysis

Slipped capital femoral epiphysis (SCFE) is a hip disorder that occurs in adolescents, often during the first pubertal growth spurt. It is more common in males and in obese children. The proximal femoral epiphysis displaces medially and posteriorly due to disruption of the growth plate.

SCFE generally presents as a painful limp. The pain can be referred to the thigh or the knee. About one quarter of patients have bilateral involvement. On physical exam, the internal rotation of the hip is limited.

The AP and lateral radiographs are the keys for diagnosis. The radiographs will show a widened and irregular physeal plate, displaced both medially and posteriorly.

Patients with a slipped epiphysis should be referred to orthopedics for surgical pinning of the femoral head.

Malignancy

Although uncommon, some childhood malignancies can present with a limp. In young children, systemic malignancies such as leukemia can cause bone pain and limp. In adolescents, bone tumours like osteosarcoma present with pain in a long bone.

Clinical features that would make you suspicious of malignancy include pain which is out of proportion to the physical findings, weight loss, anorexia, pain which waked the child at night, abnormal bruising, pallor, or masses. Lab findings of anemia, low white count or platelet count would also be a concern.

A discussion of specific types of neoplasms and their management is beyond the scope of this podcast, but you should remember that neoplasms are in the differential for both acute and chronic limps in children

Juvenile Idiopathic Arthritis

Juvenile idiopathic arthritis can also cause a limp. Symptoms however tend to evolve gradually over several weeks. Stiffness or refusal to walk in the morning is typical of inflammation. One or more joints may be warm and swollen, and the range of motion may be decreased. 25% of children with JIA have only one joint involved. One subtype –systemic onset - is accompanied by fever, rash, lymphadenopathy and hepatospenomegaly.

Some children with JIA will have inflammation of their eyes – called uveitis – which is usually not symptomatic. Ophthalmology examination at diagnosis and regular intervals after is necessary to make the diagnosis and institute therapy.

Many children with JIA will have a normal CBC and normal to mildly elevated ESR and CRP. Rheumatoid factor is almost always negative, and ANA will be positive in about half of children with JIA. The X-rays do not show bony changes until late in the disease.

The diagnosis of JIA is made on clinical grounds and is a diagnosis of exclusion. It consists of at least six weeks of joint swelling with or without stiffness and pain. You will need to rule out other possible causes for the limp.

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Treatment of juvenile idiopathic arthritis often begins with non-steroidal anti-inflammatory drugs. Improvement may take 6 to 8 weeks. In the case of a single joint, intra-articular steroid injection is also an option. If the arthritis is severe, or does not respond to NSAID treatment, referral to a pediatric rheumatologist is recommended. Additional medications are often required, with the next option usually being Methotrexate. Additionally, physical and occupational therapy have an important role to play in the treatment of JIA.

Trauma

Trauma is the most common cause of an acute limp in children. In most cases, children will have had an injury just before the limp develops. However, if there is no history of injury or if the mechanism of injury is not consistent with the clinical findings, you should consider the possibility of physical abuse. For more information on this topic, there is a chapter on fractures in the "Physical Abuse of Children" podcast.

In toddlers, the bones are relatively soft and may bend or buckle rather than fracture completely. Children also may damage the growth plate when they fracture a long bone, which can cause problems with bone growth and deformity as they continue to grow.

Sprains and strains are uncommon in younger children, as their softer bones are more likely to break from trauma However, as children approach adolescence, sprains, strains, stress fractures and other repetitive injuries are more common.

On examination, fractures are most often detected by finding of a well-localized area of tenderness, swelling, deformity and bruising. Plain radiographs of the suspected area will be needed to make the diagnosis.

The management will depend on the specific type of injury sustained. In general, casting is the gold standard treatment for fractures in children.

Take-home Points

This concludes our podcast. Here are the take-home points:

1. Musculoskeletal pain and limps are common reasons for children to seek medical attention.
2. In some cases the cause is obvious – especially if there has been an injury. If not, a careful history, combined with physical examination and focused investigations will usually help you arrive quickly at a diagnosis.
3. Some diagnoses while not common are very serious. Infections -particularly septic arthritis – can cause permanent damage to bones and joints if treatment is delayed, so these are important diagnoses to rule out in a child with fever.

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4. If after your assessment and investigations, the diagnosis is not obvious, it is important to regularly reassess the child until a diagnosis can be made.

References

References available upon request.

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