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Knee pain in children as a symptom of hip disease: a case study

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ABSTRACT

Introduction
Knee pain in the pediatric population is a very common health issue in family doctor practice and its cause is not always obvious and easy to determine. It is important to remember that knee pain can also occur as a projection of the obturator nerve conducting signals from the hip joint. During physical examination the hip joint should be also carefully examined. Diagnostic imaging such as radiographs are helpful in evaluating bone parts, whereas ultrasonography and MRI can reveal pathology in periarticular soft tissue. Laboratory tests can help to rule out a septic process and reveal other associated conditions.
The aim
The aim of this work was to analyze the patient's case of transient synovitis of the hip manifested by knee pain and discuss other hip joint causes of knee pain in the pediatric population.
Case report
An individual case report of the five-year-old male patient suffered from non-traumatic knee pain and inability to walk with analysis of undertaken diagnostic and treatment management.
Results
The patient was correctly diagnosed with transient synovitis of the hip joint and successfully treated due to a thorough physical examination and right diagnostic tests carried out by the emergency physician.
Conclusions
In every case of non-traumatic knee pain, hip pathology should be always ruled out. Carefully performed physical examination, basic laboratory tests and imagining allow practitioners to make the right diagnosis.

Key words: knee pain in children, transient synovitis, septic arthritis, Legg-Calve-Perthes Disease, Slipped Capital Femoral Epiphysis

INTRODUCTION

Knee pain in the pediatric population is a very common health issue in family doctor practice. Knee pain in children can have various causes starting with growing pains that usually do not require treatment ending up with malignant musculoskeletal tumors so early diagnosis is the key to proper treatment. It is important to remember that knee pain can also occur as a projection of the posterior ramus of the obturator nerve conducting signals from the hip joint. Missing this fact may result in a delay in diagnosis.[1–3] The first step to identify the location of pathology is physical examination. The basic assessment should include gait, standing position, strength, range of passive and active motion and palpation of periarticular tissue.[4] The next step consists of diagnostic imaging and laboratory tests. Radiographs, especially AP and frog leg lateral view, are helpful in evaluating bone parts, whereas ultrasonography and MRI can reveal pathology in periarticular soft tissue.[5] Laboratory tests including WBC count, C-reactive protein, ESR, plasma procalcitonin help to determine if it is a septic inflammation.[6] This case report examines a five-year-old male patient with knee pain correctly diagnosed with transient synovitis of the hip due to right diagnostic steps. Further, the differential diagnosis of hip diseases manifesting as knee pain will be discussed.

CASE REPORT

A five-year-old male patient presented to the Emergency Department with right knee pain and inability to walk and bear weight on the affected extremity. The patient was alert, oriented, all vital signs were within normal limits. The pain occurred the day prior and was exacerbated by walking or standing. The pain was alleviated by reducing weight bearing. The patient's mother denied any trauma. She claimed he had had a runny nose for 3 weeks without fever or any other general symptoms.
The physical examination demonstrated limited active and passive range of motion of the right hip, especially internal rotation, caused by the pain. Further physical assessment revealed congested nasal cavity, throat redness, reddish swollen tonsils. There were no pathological findings in neurovascular examination. Radiographs (AP and frog-leg lateral view) did not reveal pathology within bone parts of the hip joints (Figure 1). Laboratory test panel included complete blood count (CBC), C-reactive protein (CRP), urinalysis (UA) and venous blood gas (VBG). The only abnormality was leukocytosis (white blood cell count (WBC): 14 000 cells/microL) probably caused by viral upper respiratory infection. All other test results were within normal limits as well as body

temperature. A specialist in orthopedics performed an ultrasound scan of the patient's hip joints demonstrating fluid in the right joint capsule. Transient synovitis was diagnosed as a diagnosis of exclusion.
The patient was admitted to the pediatric ward. Restricted activity, warm compresses in the groin area and ibuprofen in pediatric dose was ordered. In control laboratory tests WBC level decreased to 7 900 cells/microL. All symptoms subsided within a few days. On physical examination the active and passive range of motion of the right hip was normal. The patient was discharged home in good overall condition.

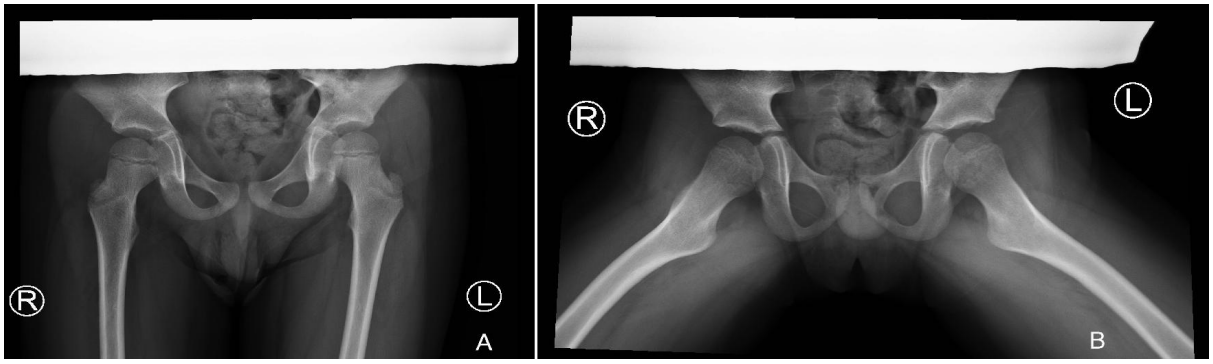

Figure 1. Radiographs of the patient: A - AP pelvis view, B - frog-leg lateral view

DISCUSSION

Transient synovitis is an acute, non-specific inflammation of the joint synovium. Despite being a benign, self-limited condition, transient synovitis is a diagnosis of exclusion and must be differentiated from septic arthritis due to similar symptoms and completely different management of both conditions.
Many proposed causes of transient synovitis can be found in the medical literature, however, the exact etiology is unknown. The most frequently mentioned risk factors include preceding upper respiratory infection, bacterial infection (post-streptococcal toxic synovitis) or recent trauma. Also it may be related to higher interferon concentration or allergic reaction (also postvaccine or drug-mediated reactions). The total lifetime risk of transient synovitis of the hip is estimated to be 3% and most frequently affects children aged 3 to 10 years old with the male to female ratio of 2:1.
The nonspecific inflammatory process causes hypertrophy of synovial lining. The acute inflammatory phase manifests as a self-limiting pain resolving within 24 to 48 hours. The pain may occur in the hip, groin, tight or knee joint. The patient usually also presents with a functional disorder of affected extremity from slight limp to refusal to bear weight.
Physical examination usually reveals mild to moderate restriction of motion especially abduction and internal rotation. Relaxed hip presents in flexion, abduction, and external rotation as a position decreasing intracapsular pressure. Up to one-third of patients with transient synovitis may present with normal range of motion. Provocative maneuvers such as the log roll or FABER (flexion, abduction, external rotation) test can be also performed. The pain should be elicited on the ipsilateral anterior side of the affected hip joint. However, if the pain occurs posteriorly around the sacroiliac joint on the contralateral side, it suggests the pathology in that joint. [7]
Diagnostic procedures that should be performed include laboratory tests (WBC count, CRP, erythrocyte sedimentation rate (ESR) and diagnostic imaging (radiography and ultrasonography) of the hip. WBC count and ESR are used in Kocher's criteria to determine the risk (Table 2) of **septic arthritis**.[6] A CRP level >2.0 mg/dL (>20 mg/L) is a strong independent risk factor for septic arthritis. CRP is also used as a fifth criterion of modified Kocher's criteria (Table 1).[8] Radiographs are usually normal or with slight widening of the joint space indicating the presence of fluid. Ultrasound is accurate for detecting intracapsular effusion and can be used to perform ultrasound-guided hip aspiration. The fluid should be aspirated if septic arthritis is suspected. A septic joint aspirate has a positive gram stain, more than 90% polymorphonuclear cells, glucose 50 mg/dl less than serum levels.
The management in transient synovitis involves rest of activity, non-steroidal anti-inflammatory drugs (NSAIDs), the application of heat, massage modalities. If the diagnosis is unclear the patient should be admitted for observation. Clinical improvement is generally observed after 24 to 48 hours. Complete symptom resolution usually takes up to 1-2 weeks. The recurrence of transient synovitis is about 20%. [9]

Modified Kocher Criteria
WBC > 12,000 cells/µl of serum
inability to bear weight
fever > 38.5° C
ESR > 40 mm/h
CRP >2.0 mg/dL

Table 1. Modified Kocher Criteria [8]

The number of fulfilled Kocher Criteria	The risk of septic arthritis
0	<0.2%
1	3%
2	40%
3	93%
4	99.6%

Table 2. The risk of septic arthritis depending on fulfilled Kocher Criteria [6]

Legg-Calve-Perthes Disease (also known as Perthes Disease) is the next pathological condition that should be considered as a cause of knee pain in children. Perthes Disease is an avascular femoral head necrosis caused by disruption of the blood supply to proximal femoral epiphysis with unknown exact pathological mechanism. Identified risk factors include positive family history, vascularization, coagulation disorders (some form of coagulopathy has been reported in up to 75% affected patients), growth factors, social conditions (maternal/passive smoking), Asian, Inuit, and Central European descent. Most common age of presentation is 4-8 years with male to female ratio 5:1. In 12% the disease can affect hip joints bilaterally with asymmetrical, asynchronous involvement. Symptoms include limping, intermittent hip, knee, groin, thigh pain and limited hip mobility - abduction and internal rotation. The diagnosis is based on imagine tests. Radiographs in AP and frog leg views reveal medial joint space widening, irregular femoral head ossification (decreased ossification center), subchondral fracture as a crescent sign. In the early stage radiographs can be normal so if the diagnosis is suspected MRI may be obtained. In clinical practice Herring's classification based on the height of the lateral pillar has prognostic significance. Catteral's classification recording the extent of necrotic area and his "head-at-

risk" signs including lateral calcification, subluxation/lateralization, metaphyseal cyst, horizontal proximal femoral physis and Gage's sign are also widely used. Preserving joint congruence is always the main goal of treatment. In children under 8 years (bone age < 6 years) with lateral pillar A nonoperative treatment is usually used, which includes physiotherapy, activity restriction during severe pain periods and observation. Operative techniques may be necessary if joint containment is lost. Also children over 8 years especially with lateral pillar B and B/C may benefit from surgical treatment. [2,10]

Slipped Capital Femoral Epiphysis (SCFE) can be symptomatic as a knee pain even in a half of cases. SCFE usually affects adolescent obese males. Other risk factors include high mechanical load, endocrine disorders (hypothyroidism, renal osteodystrophy, growth hormone deficiency, panhypopituitarism), Down syndrome, previous radiotherapy in femoral head region. The clinical manifestation depends on the form of SCFE. In the chronic form symptoms such as hip, groin, thigh, knee pain or/and limping persist for over 2-3 weeks usually up to several months gradually spontaneously disappearing which can result in a delay in diagnosis. In the acute form the symptoms persist for less than 2 weeks. There is distinguished the third form of SCFE - acute on chronic when the acute exacerbation of long-standing symptoms is observed. The physical examination reveals painful limited hip mobility and a positive Drehmann sign (obligatory external rotation during passive flexion of hip) which is pathognomonic for SCFE. Radiography in AP and frog leg lateral view should be performed if SCFE is suspected. In children under 10 years old with short stature or weight <50th percentile laboratory tests (TSH, fT4, BUN, serum creatinine) should be also performed to look for endocrine disorders. SCFE should be always treated surgically and the form of that treatment depends on the angle of slip of the femoral head from the femoral neck. In half of cases SCFE will affect the contralateral side so prophylactic surgical procedures are also used. [2,11,12]

Tumors of bone structures and surrounding soft tissue of the hip should be always ruled out in pediatric patients complaining of knee pain. Both malignant and benign lesions can irritate the obturator nerve and cause referred pain. A thorough medical history including character and circumstances of the pain is crucial. Some tumors have characteristic courses which are nearly diagnostic, e.g. osteoid osteoma is a source of dull aching pain that worsens at night and is relieved by aspirin or NSAIDs. Radiography and imaging with contrast (MRI, CT and/or bone scintigraphy) are required for diagnosis. If diagnosis is unclear, biopsy of the lesion may be necessary. Medical management depends on the nature and stage of neoplasm.[13]

CONCLUSION

The patient with knee pain and inability to walk was correctly diagnosed with transient synovitis of the hip joint and successfully treated due to a thorough physical examination and right diagnostic tests carried out by the emergency physician. In every case of non-traumatic knee pain, hip pathology should be always ruled out. The most important is to exclude a septic process performing blood tests. Then, the differential diagnosis is based on diagnostic imaging and additional tests.

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