

Hip Pain in Children, a Diagnostic Challenge: Transient Synovitis or Septic Arthritis in Early Stage?

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Short Communication

Hip pain in children is a diagnostic challenge for every practitioner in emergency medicine and for any other doctor or health professional, facing this common symptom. Diagnosis may vary from innocent conditions such as Transient Synovitis (TS), also mentioned as "irritable hip", to hazardous for the child health diseases like Septic Arthritis (SA).

Differential diagnosis includes a wide spectrum of pathological conditions, some of which require urgent investigation and treatment. Trauma, Legg-Calvé- Perthes disease, Slipped Femoral Capital Epiphysis (SFCE), arthritis, transient synovitis, joint sepsis, osteomyelitis and rarely primary or metastatic bone tumors, may be the cause of hip pain in a limping child [1,2]. A prompt and accurate diagnosis is vital for the child's health.

Hip pain in children rises serious diagnostic concern in an non-traumatic limping child, as SA must be ruled out early in order to avoid serious associated negative sequel such as osteonecrosis, growth arrest and sepsis [1]. "Septic arthritis of the hip joint in children is an emergency" [3] and early diagnosis followed by appropriate treatment guarantees a good outcome. Differential diagnosis between SA and TS in cases with a short medical history (less than 5 days) is difficult, as clinical symptoms are similar in those two pathological conditions and no radiological sign of SA are present during this period [1]. Septic arthritis should always be considered as a potential diagnosis, especially in infants and younger children presenting with hip pain, inability to bear weight, and fever or chills. Especially in infants, irritability, pseudoparalysis of the affected limb and poor feeding should be considered red flags rising a high level of suspicion [4]. In case of hip SA, joint aspiration and antibiotic treatment are mandatory. On the contrary, transient synovitis, which has a similar clinical picture, is usually self-limited and is treated symptomatically. Transient synovitis usually affects children between 3 and 10 years old, but there are reports about a 3 months old infant and also adults [2,5].

On clinical examination, when SA is present, there is effusion, tenderness and obvious limitation of the Range of Motion (ROM) of the hip, which tends to present in a specific position (slight flexion, abduction and external rotation of the leg) [4].

Plain radiographs of the radiolucent joint structures of young patients are inconclusive, especially in the early stages (less than 5 days of medical history) of a septic condition. However, they can reveal displacement or blurring of periarticular fat pads in patients with acute SA, a fact that suggests joint effusion and rules out more obvious radiographic abnormalities, such as fracture, SFCE, Perthe's disease, bone tumours or osteomyelitis [4,6-7]. Interestingly an increased hip joint space of more than 2 mm was found to be an independent multivariate predictive factor of acute SA [6]. After 5 days of

symptoms, in case of SA, a destruction or dislocation of the femoral head or a widespread destruction of the femoral head and neck may be visible radiographically.

Bone scintigraphy is neither sensitive nor specific enough in distinguishing TS from SA and is not routinely used. Nevertheless, it can diagnose multiple musculoskeletal lesions [7].

Magnetic Resonance Imaging (MRI) reveals signal intensity alterations in bone marrow in the presence of septic coxitis [8-10]. Based on these findings this diagnostic modality has been proved useful in differentiating between hip SA and TS, with the limitations established by the high cost and the difficult cooperation, especially of the younger children. The usefulness of dynamic contrast-enhanced MRI for this purpose is supported by a recent research study [11].

Ultrasound (U/S) is a noninvasive diagnostic imaging study, which is particularly useful to safely confirm the presence of joint effusion and follow up its natural history. Nevertheless false-negative results, when performed in the early course of the disease, may be recorded [9]. Therefore, negative sonograms cannot exclude SA, and do not safely differentiate between SA and TS. Therefore the use of U/S do not allow us to avoid, sometimes unnecessary, joint aspiration [9,12].

Laboratory tests are of vital importance when confronting a likely case of toxic arthritis [13]. Blood tests and more specifically C-reactive protein (CRP), Erythrocyte Sedimentation Rate (ESR) and serum White Blood-Cell Count (WBC) are considered to be especially useful.

Kocher et al. [8] reported four independent predictor factors of SA of the hip: a) ESR>40 mm/h.

b) WBC >12,000 cells/mL in combination with c) a history of fever and d) failure in weight bearing.

In an univariate analysis Jung et al. were able to detect significant differences in body temperature ($>37^{\circ}\text{C}$), serum WBC count ($>11,000/\text{mL}$), ESR ($>20 \text{ mm/h}$), CRP levels ($>1 \text{ mg/dL}$), between patients with SA and TS [7].

Caird et al. [14] stated that a C-reactive protein level of $>2.0 \text{ mg/dL}$ is a strong independent risk factor of septic hip arthritis. Oral temperature $>38.5^{\circ}\text{C}$, elevated ESR, refusal to bear weight, and an elevated serum WBC count were also found to be variables able to predict septic arthritis.

Finally in a more recent study conducted by Singhal et al. [15] a CRP $>2 \text{ mg/dL}$ was the strongest independent risk factor for SA. This determinant alone in combination with weight-bearing status was found to be independent predictors in differentiating SA from TS.

Nowadays, there is no sensitive and specific test for the differentiation of SA and TS. Considering that CRP is an acute phase

reactant (compared to ESR), and that it is the stronger independent factor of SA, we propose the assessment of these five factors described in the literature: CRP >2 mg/dl, inability to bear weight, oral temperature more than 38, 50, serum WBC count >12,000/m, and ESR >20 mm/h, with emphasis to CRP during the non-invasive differential diagnostic stage between SA and TS. The importance of this non-invasive, first diagnostic step is to spare the patients from unnecessary arthrotomies.

In case of high suspicion of SA a needle aspiration for cell count, Gram stain and culture of the synovial fluid or blood is mandatory as suggested by Rutz et al. [13] in their algorithm. The laboratory results that confirm SA are: a) positive blood or synovial culture [16], b) positive Gram stain [17], c) WBC >50,000/mm³ with a predominance of polymorphonuclear cells of the synovial fluid [18]. In case of SA the probability of a positive culture varies from 29% to 82% [19]. An empirical antibiotic therapy has to start immediately as there is no time to wait for the results of the cultures. Clindamycin is a first line empirical antibiotic as *Staphylococcus aureus* is the most frequent cause of SA [16,20]. Alternative antibiotics are vancomycin, trimethoprim-sulfamethoxazole, and linezolid [16,20]. Later a targeted antibiotic therapy must follow as the blood or joint fluid culture and the antibiogram are available. If the symptoms resolve and CRP decreases, the antibiotic treatment is continued for 10 days-24 weeks [21,22]. In case of unsuccessful antibiotic treatment, within the next 24 hours, a surgery is required. An arthrotomy is the most classical surgical treatment for SA. Arthroscopic irrigation with drainage or repeated ultrasound-guided aspiration and irrigation has been described recently [23,24]. In case of subluxation or dislocation of the femoral head, open reduction has been proposed. In case of widespread destruction of the femoral head and neck, a reconstructive operation is recommended.

Since satisfactory results have been reported in patients diagnosed with SA and treated within 4 or 5 days from the onset of symptoms [3,4], in any case of suspected septic hip arthritis, early diagnosis is essential in order to avoid permanent dysfunctions and devastating consequences for the child's health.

A thorough clinical examination is mandatory and must be followed by the appropriate imaging and laboratory tests.

Blood examinations including CRP, ESR and serum WBC are imperative as these tests contribute significantly to the accurate and rapid diagnosis of SA. In case of SA joint aspiration is mandatory and immediate antibiotic treatment gives better outcome and may spare children from more invasive procedures [1,13].

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