diagnosis, as they have demonstrated superior sensitivity over conventional cultures.

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QUESTION 2: Are there conditions where the erythrocyte sedimentation rate (ESR) and other blood tests are unreliable for diagnosis of pediatric musculoskeletal infections?

RECOMMENDATION: Yes. Serum tests including ESR, C-reactive protein (CRP) and absolute white blood cell (WBC) count might be unreliable for diagnosis of pediatric musculoskeletal infections in neonates, patients with rheumatological disease, post-trauma, post-surgery, patients with Lyme arthritis and those receiving intravenous immunoglobulin (IVIG) administration.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 88%, Disagree: 3%, Abstain: 9% (Super Majority, Strong Consensus)

RATIONALE

Various serology tests including WBC count, ESR and CRP are traditionally used to diagnose septic arthritis (SA)/osteomyelitis (OM) in children. Their diagnostic value is less than synovial fluid analysis and cultures that usually are utilized to prove the infection. ESR and CRP are almost always elevated in any inflammatory process (trauma, rheumatologic disease) with low specificity for infection [1,2].

Leukocytosis is not a typical feature in children with SA [3]. It has been shown that studies including more SA rather than OM have a lower rate of leukocytosis [4]. Results of an evidence-based study showed that overall diagnostic accuracy of peripheral WBC count for SA is not acceptable regardless of selected cutoff point [1].

The challenging age group in children is neonates and young infants in whom the infection is caused by organisms, such as coagulase-negative Staphylococci [4]. Owing to the non-characteristic features of osteoarticular infection, Sankaran et al. in a prospective study reported that fever, poor feeding and irritability are seen in less than 30% of infants with SA. Beside the paucity of sign and symptoms in this study, neutrophil count was found to be normal in 70% [5].

CRP is more sensitive than ESR for diagnosis of infection; its level rising as soon as six hours after disease initiation. Different studies have shown its usefulness in the diagnosis of SA [6,7], resolution of infection in neonates [8] and its ability to differentiate transient synovitis of the hip from SA [9]. Levine et al. reported that ESR and CRP are better as negative predictors for SA, particularly when the CRP level is less than 1mg/dL with an accuracy of less than 85% [8].

Lyme arthritis in children may be associated with clinical findings similar to SA. CRP and ESR levels are reported to be increased in 64% to 100% of patients with Lyme arthritis, respectively [10,11]. CRP and ESR were not found to be useful tests to differentiate Lyme disease and SA [12]. Administration of IVIG in children can also result in increased levels of ESR, interfering with diagnosis of SA/OM and rendering the test ineffective in monitoring response to treatment [13].

Even though CRP and WBC counts of synovial samples are believed to be useful tests for diagnosis of SA and distinguishing it from juvenile inflammatory arthritis (JIA), a recent report demonstrates that these tests might not be sufficiently specific as there is significant overlap in the value of these tests in both conditions [14].

In addition, the levels of CRP and ESR may be elevated following trauma and after surgical procedures [15], rendering these tests less useful in post-trauma and postoperative periods.

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QUESTION 3: For pediatric patients with suspected septic arthritis (SA), does the clinical criteria override inconclusive laboratory tests?

RECOMMENDATION: For pediatric patients with suspected SA, the clinical criteria override inconclusive laboratory tests.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 91%, Disagree: 2%, Abstain: 7% (Super Majority, Strong Consensus)

RATIONALE

It is well known that there are no standard tests that can accurately diagnose SA in children [1–7]. Thus, it is not uncommon to face a situation where the diagnosis of SA is strongly suspected, but laboratory tests remain inconclusive [3,4]. Among all the existing diagnostic tests for septic arthritis, isolation of infective organisms from the synovial joint is considered as the gold standard for this condition [3,5,6]. However, the latter can hardly be considered a gold standard as the probability of isolating an infective microorganism from the synovial fluid of patients with SA ranges from 22%-82% [7]. Culture results are affected by numerous factors including antibiotic administration and the virulence of the infective organism.

To improve the yield of a culture, it is recommended that antibiotic treatment is initiated after joint aspiration has been performed. In case of negative culture, laboratory tests, clinical symptoms and radiological signs are important for the diagnosis of SA [1,7]. As no single diagnostic test for SA in children exists [8], it is recommended that the diagnosis of SA should rest on the opinion of experienced clinicians and override the laboratory tests [1,3,4]. A systematic review revealed that, despite the use of laboratory investigations, the gold standard for the diagnosis of SA is the level of clinical suspicion of a physician experienced in the management of pediatric patients with musculoskeletal infections [3,4,8].

Although analysis of the synovial fluid can be useful in the diagnosis of SA in children, aspiration of the joint may require administration of general anesthesia and is complicated. The decision to perform aspiration should rest with the clinician and be determined based on the degree of suspicion for SA. Diagnosis of SA should rely on less invasive tests as much as possible [5].

Despite the extensive literature investigating the clinical and laboratory features of septic arthritis, the number of studies that exist on the significance of clinical features and laboratory tests for diagnosis of SA in children is limited.

Among the eight published studies, one is a systematic review, two are retrospective studies, two are review articles, one is a community-based epidemiological study and two are case series [1–8]. Based on the evaluation of the available literature, we are unable to determine the most effective diagnostic protocol for SA in children. Among the reviewed studies, one proposes that not all children can be classified as having or not having SA on the basis of historical, clinical, laboratory or radiologic findings [8]. The latter raises the need for additional tests, such as joint aspiration.