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Pediatric Septic Arthritis of the Knee in Limited Health Facilities: A Case Report

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Abstract
Septic arthritis occurs when microbial agents infect a joint space, with the knee being one of the most affected areas. Failure to promptly diagnose or treat the condition can lead to permanent joint damage. In this report, we present the case of an eight-year-old boy who was hospitalized due to acute swelling in his right knee. This case highlights that relying solely on susceptibility testing to guide antibiotic therapy may not be sufficient in managing such conditions.
Keywords: Children; Arthritis; Septic;

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Introduction

Prompt diagnosis and treatment are necessary for septic arthritis (SA), a severe inflammation that damages the tissues and joint fluid. Septic arthritis in children is a true medical emergency and poses a unique clinical challenge to the pediatrician, rheumatologist, and orthopedic surgeon (Hristova, Hitkova, Balgaranov, Gergova, & Alexandrova, 2023). A bacterial infection that infiltrates the synovial joint is known as septic arthritis. Improving patient outcomes requires prompt diagnosis and treatment (Prince & Tulasi, 2020). Unfortunately, early clinical indications and symptoms might not be precise. If septic arthritis is not identified and treated promptly, it may result in osteomyelitis, septic shock, irreversible damage to the joint, and articular cartilage degradation (Ciatawi & Ciatawi, 2022)

Septic arthritis is a rare condition in the pediatric population, with an estimated annual incidence in children ranges from 1 to 20 cases per 100,000 children depending on the geographic region, with developing countries having the highest numbers (Di Pietro et al., 2021). Seventy percent of septic arthritis affects the hip and knee joints, though it can affect any joint. The hematogenous spread of bacteria to the synovial membrane causes septic arthritis, which, if dismissed, results in inflammation, joint effusion, and eventually cartilage damage. The main source of infection in children is frequently temporary bacteremia brought on by minor trauma or concurrent illnesses. Together with young patients' immature immune responses, the synovial membrane is susceptible to invasion, which could hasten the development of joint involvement (Reis, Dias, Guimaraes, Neves, & Lopes, 2025)

SA primarily affects young children, with boys being more commonly impacted. Identified risk factors include prematurity, the use of umbilical artery catheters, central venous catheterization, and a history of previous trauma (Gigante et al., 2019). Hematogenous spread, direct inoculation during operations like arthrocentesis or intraarticular corticosteroid injection, or the extension of a contiguous focus of infection because of open fractures or traumatic injuries are some of the ways that microorganisms might infiltrate the joint area. The predominant cause of SA in children is still hematogenous infections. Hematogenous spread is still the leading cause in children, however the etiology changes with age (Swarup et al., 2020). Herein, we report the case of a patient with septic arthritis of the knee, not responsive to ceftriaxone and clindamycin.

Case Report

We present a case study of an 8-year-old boy, weighing 30 kg who was admitted to the emergency room. The patient was delivered by his parents with complaints of fever up and down for six days before admission to the hospital. In the beginning, the patient had dropped to an unknown height eight days before admission and it was said there was a small wound on the patient's right leg. Two days after the fall the patient complained of fever and pain in the right knee. In addition to the pain, the patient complained of redness and swelling of the right knee, and there was restriction in movement due to pain.

Complaints were accompanied by decreased intake and abdominal pain. The fever was said to up and down with paracetamol given by the parents and the patient's appetite decreased so the patient was brought to Trikora Salakan Hospital.

In ER was documented fever (38,8◦C). On physical examination, the right knee region appears to have edema and redness with borderline indistinctness, limitation of motion was also shown (Figure 1A and 1B). No deformity was seen but there is a minor wound on the right knee. On feeling, it is found that it is palpable warm compared to the surrounding skin, rubbery consistency, there is tenderness, swelling, right knee circumference 31cm (left knee circumference 28cm) and on the attempt to make a passive movement of his right knee, the patient cried. Range of movement of right knee is minimum due to pain, and the knee joint is stiff. No distal neurovascular deficit was reported.

Figure 1A

Figure 1B

Laboratory examination results were obtained as followed: White blood cells (WBC) count was significantly elevated 27.82/ 10^3/µL (reference: 5.0-18.0/ 10^3/µL) with 89.5% granulocytes (reference: 50.0-75.0%). Right knee X-ray showed soft tissue swelling and no sign of fracture or dislocation (Figure 2A). X-rays of the pelvis showed no abnormalities (Figure 2B). Based on clinical sign, symptoms, physical examination, laboratory results and x-rays, a diagnosis of septic arthritis of the right knee was assumed, and medical treatment was performed. There are no other specific tests that can be done due to limited facilities at the one and only hospital in banggai islands.

Figure 2A. Radiography AP/Lateral of right knee

Figure 2B. Radiography AP of Pelvis

The patient was treated with intravenous ceftriaxone at a dose of 1500 mg every 12 hours combination with oral clindamycin at a dose of 300 mg every 8 hours. Care was given under close observation. During hospitalization, antipyretics, omeprazole, and nonsteroidal anti-inflammatory drugs were administered upon requirement.

Three days after hospitalization, the patient continued to have fever with worsening knee swelling and an increase in WBC count to 38.08/103/µL (reference: 5.0-18.0/103/µL). Ceftriaxone was replaced with meropenem on the fourth day, but the patient's family insisted on discharge on the fourth day for personal reasons. So, the hospital treatment could not be continued.

Discussion

Septic arthritis in children is one of the few true pediatric emergencies. Septic arthritis is a rapidly progressive, highly destructive, and life-threatening joint disease. Septic arthritis of the knee is the most common type of septic arthritis in children, and it may result in irreversible joint damage (Rutherford et al., 2016). Acute septic arthritis frequently manifests as a hematogenous transmitted illness in children. Children's metaphyseal capillaries have slow blood flow, which worsens the disease and increases the risk of hematogenous seeding from trauma or infection (Pääkkönen, Kallio, Kallio, & Peltola, 2015). Although trauma is a relative risk factor for septic arthritis, it can also be confusing since joint concussions can cause pain without obvious indications of infection. Since early intervention is essential in the management of septic arthritis to prevent permanently damaged joint injury and systemic impacts a high level of suspicion is required to rule out this differential diagnosis (Reis et al., 2025)

In this case, the child might have a high risk of trauma and infection, regarding his trauma history 6 days before admission. The annual incidence of septic arthritis in developed countries is around 4-5 cases in every 100,000 children. Septic arthritis is more frequent in boys than girls with a ratio of 2:1. The most frequent location are large joints such as hip, knee, and ankle joints (Pääkkönen et al., 2015). Children with septic arthritis may present with nonspecific clinical symptoms. Generalized infection symptoms are frequently observed. Meanwhile, pseudo-paralysis, in which the patient attempts to keep the infected joint from moving actively, is the most reliable indicator of septic arthritis. To maintain the joint in the position that optimizes intracapsular volume, the posture is often maintained. When passive motion is tried, this symptom is also accompanied by a painful sensation. Fever, malaise, and noticeable localizing indications like erythema, local heat, and severe joint pain are among the other indicative symptoms. However, if deep joints, such as the hip, are affected, these clinical symptoms become less apparent (Ozsari, Bora, Ozdemir, & Kilic, 2016)

On physical examination, the child might demonstrate lethargy, anorexia, irritability, and an inability to move the affected leg. Clinically, the most significant findings in newborn SA are demonstrated to be local edema and mobility restriction (Ozsari et al., 2016). Our patient had limited movement of the affected leg, giving the impression of pseudo-paralysis, anorexia, and lethargy. Positive passive movements were also found in this case. Patients with septicemia are frequently afebrile since the condition does not always cause fever or a dangerous look. WBC count with differential, CRP, ESR, and blood cultures are indications for serologic testing. When assessing acute joint pain, those tests are helpful (Walker & Hennrikus, 2016). Synovial culture is the only investigation with predictive laboratory value. However, 30–70% of SA patients have negative synovial fluid cultures. This is the rationale behind orthopedic surgeons' sometimes decision to not perform joint aspiration.

Furthermore, it is recommended that the synovial white cell count is not superior than the gold standard, which is a clinical diagnosis provided by a doctor with expertise in musculoskeletal disorders (Saavedra-Lozano et al., 2017). In the patient in this case, the only laboratory test available at the hospital was WBC count and no synovial culture was performed. Septic arthritis and transient synovitis often present with similar clinical symptoms, making them challenging to distinguish. To aid in differentiating these conditions, Kocher et al. proposed four diagnostic criteria with high predictive value for septic arthritis of the hip: a fever exceeding 38.5°C, an ESR greater than 40 mm/h, a WBC count over 12,000/mm³, and an inability to bear weight. (Valisena et al., 2024)

A study identified a CRP level greater than 2.0 mg/dL as a significant independent risk factor for septic arthritis, incorporating it into Kocher's criteria. The presence of three out of these four parameters predicts hip septic arthritis with an 83% likelihood, four criteria increase the probability to 93%, and all five raise the likelihood to 98%. However, since these criteria were designed specifically for the hip, Obey et al. conducted a study to assess whether the combination of Kocher's criteria and CRP could effectively exclude septic arthritis of the knee. Their findings indicated that the criteria, along with CRP, could reliably rule out knee septic arthritis (Obey, Minaie, Schipper, & Hosseinzadeh, 2019). In this case, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels were not assessed at the time of admission. Based on the modified Kocher criteria, the child presented with a fever above 38.5°C, a WBC count exceeding 12,000/mm³, and difficulty walking on the affected limb. Meeting three of these criteria corresponds to a 72% likelihood of septic arthritis.

Differentiating septic arthritis from other inflammatory joint conditions may not always be possible using imaging investigations. Nevertheless, X-rays should always be taken as a baseline to rule out other underlying disorders such fractures and diseases like bone involvement. For children with septic arthritis, computed tomography scans are not advised due to their lower sensitivity compared to magnetic resonance imaging (MRI) and higher radiation levels. If osteomyelitis-septic arthritis or another result is suspected, magnetic resonance imaging (MRI) should be done, even though it is not usually suggested for septic arthritis. The remarkable sensitivity of ultrasonography to joint swelling makes it maybe the most informative imaging examination (Castellazzi, Mantero, & Esposito, 2016). In our case, due to limited examination equipment, only x-rays were taken, and the x-rays of the right knee showed soft tissue swelling and no signs of fracture or dislocation.

The current gold standard for diagnosing bacterial arthritis involves identifying bacteria in blood cultures or joint fluid, combined with clinical or radiological evidence indicative of the condition (Saavedra-Lozano et al., 2017). For children presenting with acute symptoms and elevated CRP levels (>2.0 mg/dL) or ESR values (>20 mm/h), Pääkkönen developed a diagnostic algorithm for septic arthritis. This approach includes performing arthrocentesis to detect purulent fluid and collect a sample for bacterial analysis (Pääkkönen et al., 2015).

Based on the patient's age, immunization history, underlying condition, aspirate Gram stain, and regional microbiological profile—which includes the community's prevalence of MRSA (methicillin-resistant Staphylococcus aureus)—the most likely causative pathogens are chosen for empirical antimicrobial therapy. Since Staphylococcus aureus or MRSA is the most frequent cause of SA, an antibiotic against them should always be used (Autore, Bernardi, & Esposito, 2020)

For children three months and upward, Staphylococcus aureus and other Gram-positive bacteria should be included in the empirical treatment. Depending on the severity of the infection, the initial option is either a first, second, or third generation cephalosporin or an anti-staphylococcal penicillin. Clindamycin should be added when a region's MRSA prevalence is greater than 10% to 15% (Agarwal & Aggarwal, 2016). In our case, we initially chose a combination of ceftriaxone and clindamycin. After three days of treatment there was no improvement, worsening of symptoms and increased number of WBC. Therefore we replaced ceftriaxone with meropenem and restart clindamycin Similar to our conditions, Yokoyama et al. described a patient who had SA of the hip brought on by a multi-sensitive strain of Streptococcus pyogenes that was responsive to clindamycin but not to aminobenzylpenicillina (Yokoyama, Yamamoto, Ukai, Ebihara, & Watanabe, 2019).

We hypothesized that the strain of Streptococcus pyogenes that was identified from our patient might create exotoxins that were only suppressed by clindamycin. Until improvement is observed in both clinical and laboratory settings, the IV antibiotic treatment should be maintained. Daily physical checks, frequent radiologic evaluations, and sequential WBC measurement provide valuable data for tracking recovery and the effectiveness of treatment. Many studies have suggested a shorter IV regimen followed by a longer oral therapy; however, the length of antibiotic therapy might vary from two to seven weeks. In any event, where clinically suitable, the switch to oral medication should be taken into consideration right away (Pääkkönen et al., 2015)

The duration of the treatment is determined by the pathogen, the patient's response, and the severity of the illness. For simple bacterial arthritis, three- to four-week antibiotic regimens are typically sufficient. If there is imaging evidence of concurrent osteomyelitis, the course of treatment should be prolonged to six weeks (Branson et al., 2017)

Conclusion

This case study demonstrated that relying solely on susceptibility testing to determine an antibiotic regimen may be insufficient in such cases. Priority should be given to the patient’s clinical condition and laboratory test results when selecting the appropriate antibiotic treatment.

Ethical Consideration

Written informed consent, signed by the patient or legal guardian, was obtained for the publication of medical data in scholarly medical publications while maintaining the privacy of personal data.

Author Contribution

The final version of the manuscript was approved for publishing after all authors participated to its writing.

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