



A case report on the septic arthritis in a newborn: therapeutic approaches and major considerations

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Abstract

Introduction: The prevalence of septic arthritis (SA) is higher in underdeveloped countries than in developed countries, and the number of hospitalizations of children for this cause is decreasing and the most prevalent age group is between 0 and 4 years of age. Clinical history and detailed physical examination are essential to make an accurate diagnosis, but the neonatal period has certain limitations. **Objective:** To report a case of septic arthritis that occurred in a newborn admitted to the Neonatal Intensive Care Unit (ICU) due to its serious condition, morbidity, and unusual evolution of the pathology in the pediatric population, scarcity of epidemiological data on the subject, still aiming address aspects of the treatment of the disease. **Case report:** Male patient, born on 09/11/2020 at Santa Casa de Tupã, Sao Paulo, with a gestational age of 36 weeks and 6 days, through cesarean delivery and without complications, obtaining APGAR 9 and 10, and maintained in a room with the mother. The morning after birth, the newborn (NB) began to groan and have mild respiratory distress. The patient evolved with worsening of the breathing pattern and oxygen was concentrated at 6L/min in Hood's Halo, presenting hyperthermia, hyperemia, and edema in the right elbow. Laboratory tests showed an increase in C-Reactive Protein and worsened hematimetric indices of the blood count, and antibiotic therapy was then started with oxacillin 50 mg/kg/dose and amikacin 15 mg/kg/day. The ultrasound of the right elbow showed skin thickening, absence of collections, and no changes in vasculature, being suggestive of cellulite. A new ultrasound of the right elbow showed bulging, intra-articular collection, and discreet collection with extra-

articular communication in the medial region, being suggestive of septic arthritis. Blood culture collection resulted in the growth of gram-positive cocci (*Staphylococcus aureus*) in a pair of samples. The patient received intravenous treatment with Vancomycin for 14 days with clinical and laboratory improvement of the infection and was discharged with the use of oral Clindamycin for another 14 days and physical therapy follow-up for rehabilitation of movement of the affected limb. **Final considerations:** Due to the unusual evolution of SA in the neonatal period, and the scarcity of literature on the pathology in this age group, the importance of further studies on the subject, and greater surveillance for neonatal diagnosis, in addition to early treatment to reduce of complications.

Keywords: Keywords: Septic arthritis. Suppurative arthritis. Pyogenic arthritis. Newborn. Pediatrics.

Introduction

Septic arthritis (bacterial arthritis, suppurative arthritis, pyogenic arthritis, purulent arthritis, and pyoarthrosis) is defined as a bacterial infection where the pathogenic microorganism invades the joint cavity, causing inflammation. It is classified as a serious infectious orthopedic disease, which can lead to severe functional disability and death if not treated and diagnosed correctly [1-3].

It has some important risk factors for its appearance, which are Diabetes Mellitus, hemophilia, sickle cell disease, primary and secondary immunodeficiencies, rheumatoid arthritis, chronic arthritis, joint prostheses, hemodialysis, history of recent surgeries, use of venous drugs, and skin infections [4-7].

Information about its epidemiology is somewhat limited, given that it is an uncommon disease. In industrialized countries, the incidence of the disease varies from 2 to 6 cases per 100,000 inhabitants. Despite being a pathology that affects all ages, septic arthritis is more prevalent in children and the elderly, and men are more affected than women [2-5]. They predominate in the juvenile age group, with approximately half of the cases occurring before the age of 20 (mainly children under 3 years old), and their incidence varies from 5.5 to 12 cases per 100,000 children, with males being two to three times more affected than the female. The knees and hips are the most affected joints [4]. However, its occurrence is not common in the neonatal period.

Also, *Staphylococcus aureus* is the most common microorganism in all age groups, except for the neonatal period, in which group B streptococci predominate, followed by *S. aureus*. Other agents generally isolated are group A beta-hemolytic streptococci, *Streptococcus pneumoniae*, and *Haemophilus influenzae* [8,9]. Premature and low birth weight babies are at greater risk of developing bacteremia and sepsis and, consequently, septic arthritis, as they remain hospitalized for a long period and undergo invasive procedures [8].

The typical feature of septic arthritis is the presence of pain, which lasts for one to two weeks, except for joint effusion, erythema, and limited movement of the affected joint. Most of the time, it affects a single joint, but it can also be polyarticular [6]. The most important symptoms are sudden onset pain, redness, fever, joint swelling, and limited function. There is also discomfort and increased body temperature [10].

Clinical manifestations usually precede hospital admission by four to seven days, depending on the patient's age group. Clinical manifestations of septic arthritis in infants and children vary according to age, site of infection, and pathogen [3]. Septic arthritis in neonates and infants (<2 to 3 months) often manifests as sepsis or elevated body temperature without a clear focus of infection [10].

School-aged children usually have an increase in body temperature, anorexia, tachycardia, and irritability. Lameness or refusal to walk and carry weight may occur when the lower limbs are affected [11]. Septic arthritis should be analyzed in all children who demonstrate a sudden rise in body temperature and arthralgia, although these changes are not always the cause [11-13]. The diagnosis can be confirmed by isolating the bacteria from synovial fluid or bacteria from patients with typical clinical features and an increased WBC

count in the synovium. The high morbidity associated with late treatment means that all children diagnosed with septic arthritis are treated as a definitive diagnosis [13].

Besides, the treatment includes sterilization, joint space decompression, and removal of inflammatory debris to relieve pain and prevent deformities or functional sequelae. Drainage combined with antibiotic therapy is the main means of treatment. The initial selection of antibiotics should follow the results of bacteriological tests. If the bacteriological test is negative or impossible to perform, it should be based on age group and risk factors. The route of administration of antibiotics should be parenteral and can be changed to oral regimens [14].

Further, the duration of antibiotic treatment depends primarily on the patient's clinical response, usually 2 to 4 weeks. For well-developed children without comorbidities, a regimen consists of parenteral antibiotics for 7 days or less, followed by oral administration for 3 weeks [15]. The prognosis of patients with SA is evaluated through the lethality and functional damage of the joint involved in the short and long term. The incidence of septic arthritis is high, with 25% to 50% of patients progressing to bone involvement, stiffness, vascular necrosis, and hip dislocation. In children, there are changes in growth because of involvement in the growth cartilage [14]. The complications of the pathology are diverse and constitute a major health problem. Late diagnosis and initiation of treatment are often related to the disease [16].

Therefore, the present study aimed to report a case of septic arthritis that occurred in a newborn admitted to the Neonatal Intensive Care Unit (ICU).

Methods

Study Design

The present study was elaborated according to the rules of the CARE case report (<https://www.care-statement.org/>) [17]. The descriptors used were *Septic arthritis*; *Suppurative arthritis*; *Pyogenic arthritis*; *Newborn*; *Pediatrics*. The most relevant works to the proposed theme were selected, excluding those that did not contemplate the objective of this study. The research was carried out to the Google Academic, Scielo, PubMed, and in scientific repositories.

Informed Consent

Data from the patient under study were obtained through the analysis and collection of information contained in medical records duly authorized by those

responsible by means of signing a Free and Informed Consent Term (FICT), whose source is stored at the institution Irmandade da Santa Casa de Misericórdia, located in Marília-Sao Paulo, where the child remained hospitalized.

Case report

Patient Information and Clinical Findings, Timeline, Diagnostic Assessment, Therapeutic Intervention, and Follow-up

Male patient, born on 09/11/2020 at Santa Casa de Tupã, Sao Paulo, with a gestational age of 36 weeks and 6 days, through cesarean delivery and without complications, obtaining APGAR 9 and 10, and kept in rooming-in with the mother. Routine prenatal consultations were carried out, where maternal thrombophilia was reported with the use of enoxaparin during pregnancy, without other comorbidities, with negative viral serological tests during pregnancy, and without infections during the gestational period.

The morning after birth, the newborn (NB) began to groan and have mild respiratory distress. Laboratory tests were collected and the patient required oxygen support with a flow of 3 liters/min circulating in the incubator. The results obtained showed that the VDRL was not reagent, C-reactive protein (CRP) of 0.1 mg/dL, hemoglobin of 17.4 g/dL, 48% of hematocrit, 20740 leukocytes/mm³, 64% of segmented, 24% of lymphocytes, and 10% monocytes, as well as 285,000 platelets per mm³ in peripheral blood.

On 09/13/2020, the NB evolved with worsening breathing pattern, and oxygen was concentrated at 6L/min in Hood's Halo, and admission to the neonatal ICU of Irmandade Santa Casa de Misericórdia de Marília-SP was requested. Upon admission to the ICU, the child progressed to need ventilatory assistance with Continuous Positive Airway Pressure (CPAP), maintaining good oxygen saturation, but persisting with some respiratory discomfort, and laboratory tests showed no evidence of infection. Chest radiography showed atelectasis on the left and a small non-hypertensive pneumothorax on the right. On physical examination, he presented alterations related only to the respiratory system, with reduced breath sounds in the left hemithorax, without adventitious sounds, with moderate subdiaphragmatic retraction.

After one day, the patient evolved with the need for BiPAP (Bi-level Positive Airway Pressure), and on 09/15/2020, it was also necessary to perform right chest drainage, which was uneventful. The following day, the NB was stable after drainage, returning to the ventilatory strategy with CPAP. On 09/18/2020, the

CPAP was removed and the chest drain was clamped.

On 09/20/2020, the patient presented hyperthermia, hyperemia, and edema in the right elbow. Laboratory tests showed an increase in C-Reactive Protein and worsened hematimetric indices of the blood count, and antibiotic therapy was then started with oxacillin 50 mg/kg/dose and amikacin 15 mg/kg/day, as well as the use of a peripherally inserted central catheter (PICC). The following day, an ultrasound of the right elbow was performed, which showed skin thickening, absence of collections, and no changes in the vasculature, which was suggestive of cellulite. Blood culture collection resulted in the growth of gram-positive cocci (*Staphylococcus aureus*) in a pair of samples, motivating the change in antibiotic therapy to vancomycin 15 mg/kg/dose.

On 09/30/2020, a new ultrasound of the right elbow was performed, which showed bulging, intra-articular collection, and discreet collection with extra-articular communication in the medial region, signs suggestive of septic arthritis. In the orthopedic evaluation, the bulging region was observed, with discreet hyperemia, without injuries, present palmar grip test, but without performing wrist and finger extension, keeping the limb in a possible antalgic position and with defense against the attempt of passive extension of the elbow, suggesting the possibility of radial nerve injury.

Therefore, surgical drainage of the intra-articular collection was scheduled. Excision of the joint capsule was performed, with the output of a large amount of purulent secretion, and intra-articular lavage was performed with saline solution. During the surgical procedure, the material was collected for culture, namely: culture of a fragment of the elbow where there was a growth of *Staphylococcus aureus* (ORSA/MRSA), that is, resistant to Oxacillin and Methicillin: penicillins, cephalosporins, other beta-lactam antibiotics associated or not with beta-lactamase inhibitors are not effective against this microorganism. Culture of the purulent secretion from the elbow was also performed, which identified the same microorganism with the same sensitivity pattern.

The patient received intravenous treatment with Vancomycin for 14 days with clinical and laboratory improvement of the infection and was discharged with the use of oral Clindamycin for another 14 days and physical therapy follow-up for rehabilitation of movement of the affected limb.

Discussion

The prevalence of septic arthritis is higher in

underdeveloped countries (5 to 20 per 100,000 children) than in developed countries (4 to 10 per 100,000 children). The number of hospitalizations of children is decreasing, knowing that the most prevalent age group is between 0 and 4 years of age [18]. Taking into account gender, the literature says that AS is more commonly found in male patients, representing approximately 66.9% of cases [19]. Therefore, the reported patient matches the most common epidemiological data. According to WESTON et al, in the vast majority of cases (85.2% in a sample of 243), only one joint is affected. In the case described, only the elbow was affected, representing 9.1% of all cases. The most frequent are the knee (30.5%) and the hip (16%) [20].

When it comes to diagnosis, a detailed clinical history and physical examination are essential to exclude possible differential diagnoses, especially with an emphasis on inflammatory and infectious causes, with emphasis on transient synovitis. This is the main differential diagnosis of septic arthritis, as the clinical picture is similar, but it is idiopathic and aseptic inflammation of the synovium [15]. As it is aseptic, infectious signs such as leukocytosis, increased erythrocyte sedimentation rate, and C-reactive protein are not usually elevated; nor altered imaging exams. The clinical picture is self-limiting and the mean duration of symptoms is 10 days, with gradual and spontaneous resolution in most cases [15,16,18-25].

To aid diagnosis, laboratory markers are usually requested in the investigation of septic arthritis, such as white cell count, red cell count, procalcitonin, and C-reactive protein (CRP) levels [22]. However, because they have several limitations in terms of sensitivity and specificity, especially in neonates, of which only 20% have some change in their white blood cell count, it is necessary to carry out a radiological and biological investigation using samples, which are indispensable since that allows determining which agent is responsible and the best drug of choice for treatment [22]. It is noteworthy that CRP is an excellent negative predictor [26] because, at values lower than 1.0 mg/dL, 87% of children do not have septic arthritis [19-22].

In the case of imaging tests, usually, ultrasound (USG) is the method of choice because it is practical, non-invasive, and does not emit radiation [1]. They should be performed to confirm the site of infection, assess the integrity of the joint and adjacent structures, observing whether there are any complications such as destruction of articular cartilage and metaphyseal bone destruction observed in cases of chronic osteomyelitis, in addition to aiding in aspiration [22]. An algorithm was proposed for performing magnetic resonance

imaging, based on five criteria: age > 3.6 years; CRP > 13.8 mg/L; symptom duration > 3 days; platelets < 314 x 10 cells per mL and neutrophils < 8.6 x 10 cells per mL [1]. Those who meet 3 or more criteria are classified as high-risk patients, who would benefit from MRI, as well as patients with involvement of the shoulder or elbow joint, due to their high rate of progression to osteomyelitis [1].

For an etiological diagnosis, a culture of synovial fluid or blood culture is necessary. According to the literature, blood culture is positive in only 57% of cases [21] and synovial fluid culture in 90% of cases [24]. The most commonly found etiologic agents are *Staphylococcus aureus* and beta-hemolytic type B Streptococcus [20-21], corresponding to the case presented. However, there are other less common pathogens, such as *Kingella kingae* [18-23].

For treatment, it is important to isolate the etiologic agent in the synovial fluid and to determine the sensitivity to the antibiotic. Generally, the initial therapy chosen is twofold, aiming to combat bacteria of the gram-negative and positive spectrum [21]. Thus, the empirical antibiotic therapy of choice was oxacillin and amikacin. After blood culture collection, surgical drainage of the intra-articular collection, and identification of the etiologic agent, antibiotic therapy was escalated to vancomycin 15/mg/kg/dose with intravenous administration, due to its sensitivity.

It is of great importance that the diagnosis is immediate and the treatment started early, to avoid irreversible joint damage [21], growth interruption, osteonecrosis, or sepsis [26,27]. This may be a difficulty encountered, as the clinical signs are nonspecific in newborns. The most common short and medium-term complications are decreased joint mobility, readmission, surgical reintervention, and elbow abscess [28]. In the case presented, only the first one was present.

According to a survey that gathered information from 48 cases of neonates with septic arthritis, in 72.9% of the cases, there was a total improvement of the joint conditions. Among the cases in which the elbow was the target joint, 78.9% resulted in full recovery, giving a good prognosis to the patient in the report [27]. The patient responded well to the treatment, improving and being discharged. Physiotherapeutic follow-up and continuation of oral antibiotic therapy with Clindamycin for 14 days were requested, following the literature, which recommends 2 weeks of intravenous treatment, followed by another 2 weeks of oral treatment in newborns, as they are immunosuppressed [27].

Conclusion

Although the newborn in question fits the most frequent epidemiological profile of SA, his clinical picture was unusual, thus making it difficult to diagnose and intervene that could prevent him from progressing so seriously. It is necessary to request when the disease is suspected, auxiliary tests, such as laboratory markers, ultrasound, and magnetic resonance imaging (if available and necessary), in addition to blood culture and culture of synovial material. These are intended to rule out differential diagnoses and allow adequate and early therapeutic conduct, aiming to avoid possible complications and irreversible damage. It is worth mentioning its importance in the identification of resistant bacteria, such as the one mentioned in the case under discussion. Given the scarcity of literature on the subject, the present work aimed to contribute to the enrichment of professionals who may be faced with similar situations.

Acknowledgement

Nil.

Informed consent

Data from the patient under study were obtained through the analysis and collection of information contained in medical records duly authorized by those responsible by means of signing a Free and Informed Consent Term (FICT), whose source is stored at the institution Irmandade da Santa Casa de Misericórdia, located in Marília-Sao Paulo, where the child remained hospitalized.

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Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

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