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Epidemiology and Management of Neonatal Septic Arthritis: Insights from a State Referral Institute

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Abstract

Septic arthritis in neonates, especially of the hip joint, is a severe infection that can lead to destruction of the joint if not promptly treated. This study evaluates the common causative organisms and management strategies for neonatal septic arthritis at a state referral institute. We reviewed 68 cases of neonatal septic arthritis involving 88 joints. The pre-operative evaluation included history, blood tests and radiological assessments. Most neonates underwent surgery the same day as diagnosis. Samples were analyzed using Gram staining and culture sensitivity. Post-operative monitoring included scans and measurements of erythrocyte sedimentation rate and C-reactive protein at the 3rd and 6th weeks. Oral antibiotics were administered for six weeks. The neonates had an average age of 22 days, with most (60 cases) admitted to the NICU. The hip joint was the most commonly affected (65 joints), followed by the knees (14), shoulders (6), elbows (2), and wrists (1). Pathogens included Klebsiella (29 joints), MRSA (10), Candida (9), and E. coli (3). Less common organisms included alpha-haemolytic Streptococcus, Citrobacter, Enterobacter, and Enterococcus. No growth was found in 26 joints. Carbapenems used in 34 joints, Aminoglycosides and Cephalosporins in 18, Glycopeptides in 7, Azoles for fungal infections in 9, Polymyxins in 4, Beta-lactams in 9, and others in 9. The average duration of injectable antibiotics was 9.7 days. Neonatal septic arthritis remains a critical condition requiring immediate surgical intervention and tailored antibiotic therapy. The emergence of uncommon organisms underscores the need for standardized care protocols to improve outcomes and minimize joint damage. Early diagnosis and prompt treatment are essential to prevent long-term morbidity.

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INTRODUCTION:

Septic arthritis of the hip joint is an infection of the synovium and subsequently of all the structures within the joint, which possibly leads to destruction of the articular cartilage and later of the complete joint. Group B streptococcus, Staphylococcus and gram negative bacteria are the common bacterial organisms. The purpose of this study was to evaluate the common organisms and management for septic arthritis in neonates in our hospital, which is a state referral institute.

LITERATURE REVIEW:

Septic arthritis in neonates is a severe and potentially debilitating condition that requires immediate medical attention. The infection involves the synovium and other joint structures, often leading to rapid joint destruction if not promptly addressed.

Neonates are particularly vulnerable due to their immature immune systems and unique anatomical features, such as the transphyseal vessels that penetrate the physeal plate up to 18 months, which can facilitate the spread of infection.

The most common causative organisms include Group B Streptococcus, Staphylococcus aureus, and Gram-negative bacteria. However, with the increasing use of broad-spectrum antibiotics, there has been a rise in infections caused by uncommon organisms like Candida, Citrobacter, Enterobacter, and Enterococcus. Previous studies have highlighted the predominance of Staphylococcus aureus and Streptococci, but the spectrum of pathogens has evolved, necessitating continual reassessment of empirical antibiotic choices[1+2].

Neonates with septic arthritis often present with non-specific symptoms such as irritability, failure to thrive, reduced feeding, lethargy, and sometimes distressing joint movements. Joint effusion and erythema may not always be evident, complicating early diagnosis[3]. Diagnostic tools include synovial fluid aspiration for Gram staining and culture, blood cultures, CRP levels, and ultrasonographic evaluations[4]. Early diagnosis and prompt surgical intervention, typically through arthrotomy, are critical to prevent irreversible joint damage. Empirical antibiotic therapy should be initiated based on the most likely pathogens, followed by culture-specific antibiotics for 3 to 6 weeks. Common antibiotic regimens include Carbapenems, Aminoglycosides combined with Cephalosporins, Glycopeptides, Azoles for fungal infections, Polymyxins, and Beta-lactams[5+6].

Despite advances in neonatal care, septic arthritis remains a significant cause of morbidity. Improved NICU care has paradoxically introduced new challenges, such as the emergence of antibiotic-resistant and uncommon pathogens. The prognosis largely depends on the timeliness of intervention and the extent of physeal involvement, with early and aggressive treatment being associated with better outcomes[7].

The literature underscores the critical need for standardized management protocols and vigilant monitoring to mitigate the adverse effects of neonatal septic arthritis. Continued research and adaptation of treatment strategies are essential to address the evolving pathogen landscape and improve neonatal joint health outcomes.

MATERIALS AND METHODS:

This retrospective study was conducted at a state referral institute, focusing on neonates diagnosed with septic arthritis between 2018 and 2023. The study included 68 cases involving 88 affected joints[1]. Ethical board clearance was obtained prior to data collection[1].

Neonates aged 0-60 days with clinically and radiologically confirmed septic arthritis were included in the study[2]. Exclusion criteria were incomplete medical records or follow-up data.

Routine pre-operative evaluation included a detailed medical history, physical examination, blood investigations (complete blood count, ESR, CRP levels), and radiological assessments (X-rays and ultrasonography of affected joints) [3+4].

All neonates underwent surgical intervention as soon as possible, with most surgeries performed on the same day of diagnosis[5]. Arthrocentesis was initially performed to aspirate synovial fluid for Gram staining and culture sensitivity tests[6]. This was followed by arthrotomy under aseptic conditions[7].

Post-operatively, the patients were monitored with repeat scans and blood tests, including ESR and CRP, at the 3rd and 6th weeks[8]. Oral antibiotic therapy was continued for six weeks based on culture sensitivity results[8]. Injectable antibiotics were administered for an average duration of 9.7 days (range: 5-33 days) [8].

Empirical antibiotic therapy was initiated with broad-spectrum antibiotics and adjusted based on culture sensitivity results[9]. The antibiotics used included:

- Carbapenems: 34 joints[9]
- Aminoglycosides and Cephalosporins combination: 18 joints[9]
- Glycopeptides: 7 joints[9]
- Azoles (for fungal infections): 9 joints[9]
- Polymyxins: 4 joints[9]
- Beta-lactams: 9 joints[9]
- Other antibiotics (including Fluoroquinolones and Oxazolidinones): 9 joints[9]

Data were collected from medical records, including patient demographics, maternal factors (age, education, mode of delivery, birth order), neonatal factors (birth weight, NICU admission duration, organisms identified, and outcomes) [10]. Descriptive statistics were used to analyze the data, focusing on the prevalence of different pathogens, antibiotic regimens, and clinical outcomes[10].The primary outcome measures were the resolution of infection, joint function at follow-up, and any complications[11]. The extent of joint destruction and long-term morbidity were also assessed based on clinical and radiological evaluations[11]. This study had several limitations, including its retrospective design, reliance on medical records for data accuracy, and variability in the duration of illness before hospital presentation[12]. Additionally, the bacterial culture

reports were based on the disk diffusion technique, which might affect the sensitivity results[12].

By understanding the materials and methods of this study, we aim to provide a comprehensive approach to managing neonatal septic arthritis, highlighting the importance of early diagnosis, immediate surgical intervention, and appropriate antibiotic therapy[13].

RESULTS:

A total of 68 neonates with septic arthritis affecting 88 joints were included in this study. The average age of the neonates was 22 days, with a range of 1 to 60 days[1]. Sixty cases required NICU admission for an average duration of 8.9 days due to various neonatal problems[2]. The hip joint was the most commonly affected, with 65 out of 88 joints involved[3]. Other joints affected included 14 knees, 6 shoulders, 2 elbows, and 1 wrist[3].

The pathogens identified included Klebsiella in 29 joints, Methicillin-resistant Staphylococcus aureus (MRSA) in 10 joints, Candida species in 9 joints, and Escherichia coli in 3 joints[4]. Less common organisms included alpha-hemolytic Streptococcus in 2 joints, Citrobacter in 1 joint, and Enterobacter and Enterococcus in 4 joints each[5]. Notably, 26 joint cultures showed no microbial growth, indicating possible pre-treatment with antibiotics or limitations in culture sensitivity[6].

Various antibiotics were used based on culture sensitivity. Carbapenems were used in 34 joints, Aminoglycosides and Cephalosporins combination in 18 joints, Glycopeptides in 7 joints, Azoles in 9 joints for fungal infections, Polymyxins in 4 joints, Beta-lactams in 9 joints, and other antibiotics (including Fluoroquinolones and Oxazolidinones) in 9 joints[7]. The average duration of injectable antibiotic therapy was 9.7 days, with a range of 5 to 33 days[8].

DISCUSSION:

This study highlights the complexity and challenges in managing septic arthritis in neonates. The high incidence of hip joint involvement aligns with previous studies, emphasizing the need for vigilant monitoring of hip health in this population[3+9]. The predominance of Gram-negative organisms like Klebsiella and the presence of uncommon pathogens such as Candida species reflect the evolving microbial landscape, possibly due to extensive antibiotic use and improved NICU care[4+10].

Early diagnosis and prompt surgical intervention are crucial for preventing joint destruction and ensuring better outcomes. The importance of early arthrocentesis followed by arthrotomy is underscored by the improved joint function observed post-operatively in our series[11]. The variability in the microbial spectrum necessitates an individualized approach to antibiotic therapy, guided by culture and sensitivity results, to effectively eradicate the infection and prevent the emergence of resistance[7].

CONCLUSION:

Septic arthritis in neonates is a critical condition that demands immediate attention and aggressive management to prevent severe joint damage and long-term morbidity. Our study demonstrates the necessity for early diagnosis, prompt surgical intervention, and appropriately tailored antibiotic therapy to combat the diverse and sometimes uncommon pathogens responsible for neonatal septic arthritis.

The findings highlight the hip joint as the most commonly affected site, with a significant prevalence of Gram-negative organisms like Klebsiella and emerging pathogens such as MRSA and Candida species. This evolving microbial landscape underscores the need for continuous monitoring and adjustment of antibiotic regimens based on culture and sensitivity results.

Despite advancements in NICU care, which have improved neonatal survival rates, they also pose new challenges in managing infections like septic arthritis. The variability in microbial pathogens and the emergence of antibiotic resistance call for a standardized protocol that includes routine pre-operative evaluations, immediate surgical intervention, and thorough post-operative care.

Future research should aim at prospective studies to validate our findings and refine management strategies. Additionally, there's a need to focus on preventive measures, including strict aseptic techniques in NICU and careful monitoring of neonates for early signs of infection.

By implementing uniform protocols and maintaining vigilance in the early detection and treatment of joint infections, we can significantly reduce the morbidity associated with neonatal septic arthritis and improve long-term outcomes for affected infants.

LIMITATIONS:

The retrospective design of this study and reliance on medical records introduce potential biases and inaccuracies in data collection. Additionally, the duration of illness prior to hospital presentation varied, which could affect the outcomes and interpretations[12]. The use of disk diffusion techniques for culture sensitivity might also limit the precision of antibiotic efficacy assessments[6].

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