RISK FACTORS AND CLINICAL PRESENTATION OF SEPTIC ARTHRITIS OF HIP IN INFANTS: A PROSPECTIVE STUDY

PADMARAJ PATIL*, SATISH PATIL, PRAVIN SONUNE, GOURAV GIRADKAR

Department of Orthopaedics, PIOS Medilinks Private Limited, Jaysingpur, Maharashtra, India. Email: dr.patilpadmaraj@gmail.com

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ABSTRACT

Objective: The objective of this study was to analyze the risk factors and clinical presentation of septic arthritis of hip in infants.

Methods: Thirty infants with unilateral septic arthritis of hip were included in this study on the basis of a pre-defined inclusion and exclusion criteria. The study was conducted in PIOS Medilinks Pvt. Limited, Jaysingpur, Kolhapur, India. The duration of the study was 18 months from June 2021 to December 2022. The institutional ethical committee approved the study. The diagnosis of septic arthritis was made on the basis of Morrey’s criteria. Risk factors associated with septic arthritis and clinical presentation were studied.

Results: Out of the total 30 infants diagnosed to be having septic arthritis of unilateral hip, 17 (57.67%) were males and 13 (43.33%) were females. In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). Low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.33%) patients. All infants having septic arthritis had increased local temperature (100%) and reduced joint movements (100%). Erythema (86.67%), swelling (73.33%), and irritability (60%) were other common clinical features associated with septic arthritis. The most common offending organism was Staphylococcus aureus (33.33%) followed by Klebsiella pneumoniae (13.33%). The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion.

Conclusion: Septic arthritis of hip in infants is an emergency and requires prompt treatment. Any delay in diagnosis can have catastrophic consequences. However, in majority of appropriately managed infants, there is no residual damage to the affected joint.

Keywords: Septic arthritis, Morrey’s criteria, Joint effusion, Clinical presentation, Outcome.

INTRODUCTION

Septic arthritis is caused by infection and inflammation of hip joint. Septic arthritis in neonates and infants can be considered an emergency. High index of suspicion, early diagnosis, and prompt antimicrobial treatment is essential. Any delay in the diagnosis can have catastrophic consequences such as permanent damage to hip joint. In many cases of septic arthritis of hip in neonates, the diagnosis is delayed because of subtle as well as non-specific signs and symptoms [1].

The most common cause of septic arthritis in neonates as well as infants is hematogenous spread of microorganism from a distant focus. Irrespective of the etiology of arthritis, the inflammatory process that ensues consists of release of proteolytic enzymes by inflammatory cells. These proteolytic enzymes cause damage to joint cartilage [2]. This inflammatory process, release of proteolytic enzymes, and damage to joint cartilage result in compression of intra-articular blood vessels, thereby further compromising blood flow to the cartilage as well as bones in the vicinity. These changes if progress unchecked may cause necrosis and destruction of synovium and cartilage of hip joint, and this destructive process may quickly spread to involve ligaments, femoral head, and adjacent bone [3].

The offending organism may depend upon the age of infant. In neonatal period as well as infants <2 months of age, the most commonly involved organisms may include Staphylococcus aureus, Escherichia coli, Group B streptococci, and Gram-negative bacilli such as Pseudomonas. In older infants such as between the age of 2 months and 1 year, the common offending organisms include Haemophilus influenzae, S. aureus, Group A streptococci, and Streptococcus pneumoniae [4]. Irrespective of the offending organism, the clinical presentation in early phase is subtle and non-specific. This is non-specific symptomatology which makes it extremely difficult to diagnose septic arthritis at an early stage unless a high index of suspicion is maintained particularly in neonatal period. The usual presentation in neonatal period is excessive crying associated with refusal to tolerate any range of motion. A careful physical examination may reveal little or no range of motion, local tenderness, swelling, raised local temperature, and erythema. Constitutional symptoms such as fever and refusal to feed are present in majority of infants. The differential diagnosis which needs to be considered includes transient synovitis of hip which is a transient and self-limiting condition [5].

The diagnosis is usually made on the basis of clinical examination and confirmed by imaging and analysis of synovial fluid. An arthrocentesis needs to be performed in any infant who presents with constitutional symptoms such as refusal to feed and fever along with painful monoarticular arthritis. In cases of septic arthritis, synovial fluid will have abundant white blood cells (>50,000–100,000/mL), predominantly polymorphonuclear neutrophils. Culture sensitivity of synovial fluid may help in diagnosis as well as aiding in choosing appropriate antibiotic therapy. Advanced diagnostic tests such as polymerase chain reaction can be used in identifying the involved organisms. Imaging techniques such as X-ray may show widening of joint space secondary to joint effusion; however, this is not very sensitive in the diagnosis, particularly if effusion is relatively small. Ultrasound may show the presence of effusion and is fairly sensitive in expert hands. MR imaging and scintigraphy are usually reserved for cases in which the diagnosis is doubtful [6].
Once the diagnosis is made clinically and confirmed on the basis of imaging and synovial fluid analysis, the treatment is administration of parenteral antibiotics. In cases with significant effusion, an orthopedic consultation for irrigation and drainage of effusion may be indicated.

We undertook this study to analyze the risk factors and clinical presentation of septic arthritis of hip in infants.

METHODS

This was a prospective cohort study in which 30 infants with monoarticular septic arthritis of hip were included on the basis of a pre-defined inclusion and exclusion criteria. The study was conducted in PIOS Medlinks Pvt. Limited, Jaysingpur, Kolhapur, India. The duration of the study was 18 months from June 2021 to December 2022. The institutional ethical committee approved the study. Informed and written consent was obtained from parents of the infants to be part of the study. Demographic details such as age and gender were noted. A thorough general systemic, and local examination was done. The presence of local erythema, pain, and tenderness was noted. The range of motion of the affected hip was determined. The diagnosis of septic arthritis was made when 2 of the major and 5 of the minor criteria as described by Morrey et al. are met [7] (Table 1).

All infants underwent complete blood count, C-reactive protein, erythrocyte sedimentation rate, blood culture, X-ray, and ultrasound examination of affected hip. All patients received parenteral antibiotics for 3–4 weeks. Irrigation and drainage of effusion was done in selected cases. In cases where irrigation and drainage of effusion was done, affected hip joint was meticulously debrided and extensively irrigated, and was subsequently immobilized with a continuous suction drain in a functional position for 2 weeks. Patients were followed up for 3 months. During each follow-up, the range of motion was determined. The presence of local pain or tenderness was also noted. If required, an ultrasound examination of affected hip was done during follow-up visit.

The sample size was calculated according to previous reference studies of septic arthritis hip. With assumptions 95% confidence interval, 5% marginal error and 80% power, the calculated sample size was 25. We therefore included 30 patients (more than minimum required number of patients) in our study. For statistical purposes, SSPS 21.0 software was used. Microsoft Excel was used for preparation of charts and graphs.

Inclusion criteria

1. Infants diagnosed to be having unilateral septic arthritis of hip on the basis of Morrey’s criteria for septic arthritis
2. Parents gave informed consent.

Exclusion criteria

1. Parents refused consent
2. Infants with congenital skeletal deformities
3. Infants with transient synovitis of hip.

RESULTS

Out of the total 30 infants diagnosed to be having septic arthritis of unilateral hip, 17 (57.67%) were males and 13 (43.33%) were females. There was a slight preponderance of males as compared to females in patients with septic arthritis with a M:F ratio of 1.30.76 (Fig. 1).

In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). In majority of the cases, right hip was involved (63.33%). Left hip was involved in the remaining 11 (36.67%) cases (Table 2).

Analysis of patients on the basis of risk factors for development of septic arthritis showed that low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.33%) patients. After low birth weight and premature infants, septicemia (10%), history of umbilical cord catheterization (6.67%), and birth asphyxia (6.67%) were other risk factors. History of invasive procedure and trauma was seen in 1 (3.34%) infant each (Fig. 2).

The analysis of the infants on the basis of clinical presentation showed that all infants having septic arthritis had increased local temperature (100%) and reduced joint movements (100%). Erythema (86.67%), swelling (73.33%), and irritability (60%) were other common clinical features associated with septic arthritis. Refusal to feed (46.67%) and lethargy (26.67%) were other common features seen in infants with septic arthritis (Fig. 3).

Diagnostic joint aspirate was done under ultrasound guidance in 9 (30%) cases. The analysis of blood culture and/or joint aspirate showed that the most common offending organism was S. aureus.
In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). Infants, particularly neonates, are predisposed for development of septic arthritis because of hematogenous spread of organisms from a distant focus. Immature immune system allows such a hematogenous spread to take place without much hindrance. Halder et al. undertook a study of 10 infants with septic arthritis [11]. The mean age of presentation was 15.6 days. Similar age of presentation was also reported by the authors such as Devi et al. [12] and Li et al. [1].

The analysis of risk factors in our study showed that low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.3%) patients. After low birth weight and premature infants, septicemia (10%), history of umbilical cord catheterization (6.67%), and birth asphyxia (6.67%) were other risk factors. Kabak et al. conducted a study to identify risk factors for development of septic arthritis [13]. The common risk factors associated with septic arthritis were prematurity (4/14), umbilical catheterization or venous catheterization (3/14), sepsis (3/14), perinatal asphyxia (2/14), and difficult birth (1/14).

In our study, the analysis of blood culture and/or joint aspirate showed that the most common offending organism was S. aureus (33.33%) followed by K. pneumoniae (13.33%), Group B streptococci (10%), and E. coli (6.66%). Pseudomonas aeruginosa was found to be offending organism in 1 (3.33%) patient. In the rest of the infants (33.3%), no organism was found on blood culture or culture of joint aspirate (Table 3).

All infants received parenteral antibiotics. Empiric antibiotics were started immediately (combination of cefotaxime and vancomycin) and then switched over to appropriate antibiotics depending on culture sensitivity reports. If the joint aspirate or blood culture did not yield any bacterial growth, then antibiotics were stepped up to piperacillin-tazobactam and vancomycin to cover a wide spectrum of bacterial infection. The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion. Two (6.66%) infants were found to have painless but restricted hip movements of the affected hip joint.

**DISCUSSION**

This study comprised 30 infants who had been diagnosed with septic arthritis. Out of 30 infants, 17 (56.67%) were males and 13 (43.33%) were females. There was a slight preponderance of males as compared to females in patients with septic arthritis with a M:F ratio of 1.07:1.

Madhan et al. conducted a study to analyze the clinical features and outcome of neonates with septic arthritis; for this purpose, 319 neonates with septic arthritis irrespective of the joint involved, admitted to NICU, were included in this study [8]. The neonates who did not respond to antibiotic therapy were treated by arthroscopy and lavage of the affected joint. The male-to-female ratio of the affected cases in this study was found to be 1.73:1. Male preponderance found in this study was similar to our study. Similar male preponderance was also reported by the authors such as Caksen et al. [9] and Bono et al. [10].

In our study, the overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). Infants, particularly neonates, are predisposed for development of septic arthritis because of hematogenous spread of organisms from a distant focus. Immature immune system allows such a hematogenous spread to take place without much hindrance. Halder et al. undertook a study of 10 infants with septic arthritis [11]. The mean age of presentation was 15.6 days. Similar age of presentation was also reported by the authors such as Devi et al. [12] and Li et al. [1].

The analysis of risk factors in our study showed that low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.3%) patients. After low birth weight and premature infants, septicemia (10%), history of umbilical cord catheterization (6.67%), and birth asphyxia (6.67%) were other risk factors. Kabak et al. conducted a study to identify risk factors for development of septic arthritis [13]. The common risk factors associated with septic arthritis were prematurity (4/14), umbilical catheterization or venous catheterization (3/14), sepsis (3/14), perinatal asphyxia (2/14), and difficult birth (1/14).

In our study, the analysis of blood culture and/or joint aspirate showed that the most common offending organism was S. aureus (33.33%) followed by K. pneumoniae (13.33%), Group B streptococci (10%), and E. coli (6.66%). P. aeruginosa was found to be offending organism in 1 (3.33%) patient. In the rest of the infants (33.3%), no organism was found on blood culture or culture of joint aspirate. Wang et al. conducted a study to analyze the microorganisms involved in cases of septic arthritis [14]. The predominant causative organism in this study was S. aureus (43%, 25/58), 6 isolates of which were methicillin resistant, followed by coagulase-negative Streptococcus, Streptococcus pneumoniae, Salmonella, H. influenzae Type B, and Group B Streptococcus. A similar microbiological profile in cases of septic arthritis in infants was also reported by the authors such as Youn et al. [15] and Rai et al. [16].

The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion. Two (6.66%) infants were found to have painless but restricted hip movements of the affected hip joint.

**Table 3: Organism grown either on blood culture or joint aspirate**

<table>
<thead>
<tr>
<th>Organisms in blood culture or joint aspirate</th>
<th>No of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>11</td>
<td>36.67</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>5</td>
<td>16.67</td>
</tr>
<tr>
<td>Group B streptococci</td>
<td>3</td>
<td>10.00</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>1</td>
<td>3.33</td>
</tr>
<tr>
<td>No organisms</td>
<td>8</td>
<td>26.67</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

In our study, low birth weight (33.3%) followed by Klebsiella pneumoniae (13.3%), Group B streptococci (10%), and E. coli (6.66%). Pseudomonas aeruginosa was found to be offending organism in 1 (3.33%) patient. In the rest of the infants (33.3%), no organism was found on blood culture or culture of joint aspirate (Table 3).
CONCLUSION

Septic arthritis in infants is an emergency in infants and requires a high index of suspicion for early diagnosis and treatment. The most common risk factors for development of septic arthritis are low birth weight and prematurity. If appropriately treated, majority of the infants having septic arthritis do not show any residual damage to affected joint.

CONFLICT OF INTEREST

None.

REFERENCES