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Nitin Chaudhari
Assistant Professor,
Department of Orthopaedic,
Government Medical College,
Surat, Gujarat, India

Hari Menon
Professor & Head,
Department of Orthopaedic,
Government Medical College,
Surat, India

Premal V Naik
Ex-Associate Professor,
Department of Orthopaedic,
S.C.L General Hospital, N.H.L
Municipal Medical College,
Ahmedabad, India

Vipul Chaudhari
Assistant Professor,
Department of Community
Medicine, Government Medical
College, Surat, Gujarat, India

Correspondence
Nitin Chaudhari
Assistant Professor,
Department of Orthopaedic,
Government Medical College,
Surat, Gujarat, India

A short term outcome of septic arthritis of hip in children

Nitin Chaudhari, Hari Menon, Premal V Naik and Vipul Chaudhari

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Abstract
Introduction: Despite recent clinical and scientific advances in orthopaedic care, pyogenic arthritis of hip in infancy and childhood remains a vexing and controversial problem. Although advent of antibiotic therapy decreased mortality and morbidity, but disastrous results still occur mainly in infancy and early childhood with delayed presentation. The sequelae of septic hip in children have been well documented in literature. Septic arthritis of the hip can lead to severe deformity by dislocating or damaging the femoral head and/or epiphyseal plate. Prognosis is associated with delay in treatment such as surgical decompression of the joint and administration of appropriate antibiotics. Permanent sequelae due to septic arthritis can be prevented by early diagnosis and aggressive treatment.
Materials & Methods: Prospective interventional study consisted of 24 patients with 25 Hips. Study carried out at Department of Orthopaedics of a tertiary care centre during Aug 2005 to Dec 2007. Risk factors and related laboratory investigations were carried out. Treatment completed by aspiration and anterior arthrotomy. Data entry and analysis was done by M.S. Excel 3.0.
Results: In our study about 63% patients were less than 3 months of age and 75% patients were up to 3yrs of age. More than 70% patients presented after one week and three were presented after 1 month. In many of our patients there were more than one risks factors likes septicemia, low birth weight, jaundice and ventilator support. Most of the children (88%) had high CRP level at the time of admission. Elevated CRP was seen in 81.3% patients and suspension test was positive among all neonates and infants. Normalization of movement comparable to normal side in most of the patients was observed.
Conclusion: Septic arthritis of the hip in infancy and early childhood can be devastating and can lead to serious musculoskeletal sequelae**, so** all NICU neonates should be handling with strict aseptic precaution and should be screened daily. Early proper detection and adequate treatment can avert serious complications such as avascular necrosis and destruction of the hip especially in early childhood. We hypothesized that socio-economic problems and access to health-care facilities, as well as previous visit to traditional healers, may delay presentation.

Keywords: Septic arthritis, arthrotomy, aspiration, children

Introduction
Septic arthritis of hip is a pyogenic inflammation of synovial membrane of the hip, mostly due to bacterial infection. Synovial membrane is made up of 1) intimal layer 2) sub synovial layer. It is extremely vascular in nature and it lacks a basement membrane due to which bacteria lodge in synovial membrane and escape into the joint easily [1].
The presence of the bacterial endotoxin within the joint stimulates cytokines production triggering an inflammatory cascade. A highly cellular synovial fluid with large number of polymorphonuclear leukocytes provides a potent source of lysosomal enzymes which attacks articular matrix [1, 2].
When infection is due to staphylococcus and streptococcus, serum plasminogen is directly activated by staphylokinase and streptokinase which produces fibrinolytic enzyme 'plasmin' that attacks the protein mucopolysaccharide complex of the matrix, releasing chondroitin sulfate and effecting 'chondrolysis' [2-5].
As the disease progresses, the joint capsule becomes distended by pus under pressure that may subluxate and/or dislocate the femoral head. The blood supply to the femoral head is damaged by the pressure of pus on the retinacular arteries [1, 4, 6].
Systemic antibiotics can control septicemia and reduced mortality rate but the joint must be evacuated by aspiration and preferably by surgical decompression early for good outcome [7, 9].
Delay in diagnosis and early adequate treatment, is not uncommon due to lack of awareness in primary treating physicians which may can cause subluxation and/or dislocation and destruction of femoral head, which can leads to serious musculoskeletal sequelae [7-11].

Material and Methods

Study Design: Prospective interventional study

Sample Size: With Convenient sampling method 24 patients with septic arthritis of hip under twelve years of age were selected at Department of Orthopaedics of a tertiary care centre during Aug 2005 to Dec 2007

Study Population: Children 0 day to 12 years.

Data Collection methods

The pretested, semi-structured questionnaire was used for data collection.

Procedure: Aspiration and arthrotomy.

Data Management and Analysis

After the completion of data collection, data entry and analysis was done by Excel 3.0.

Results & Discussion

In this study 63% patients were less than 3 months of age and 75% patients were up to 3yrs of age. Similar study was done by Griffin and Green. They had found that 70% patients were four years of age or younger [12].

In our study more than 70% patients presented after one week. Three patients presented after one month.

We had total 16 infants and neonates of that 13 (81%) presented after 1 week while of 8 older children 5 (63%) presented after 1 week.

Table 1: Distribution of Sex, Side of arthritis and risk factors among study population.

Variables	No. (%)
Sex	**n=24**
Male	10 (42%)
Female	14 (58%)
Side	**n=24**
Right	10 (42%)
Left	13 (54%)
Bilateral	01 (04%)
Risk Factor	**Neonates & Infants n=21**
Septicemia	09 (56%)
Ventilator support	04 (25%)
Low Birth Weight	02 (13%)
Jaundice	05 (31%)
Other Focus	01 (06%)
NICU Admission	**n=16**
Yes	15 (94.0)
No	1 (6.0)

We had female predominance in our study which is contrary to study by Bennett and Namnyak where they found male predominance [13].

In our study left sided hip involvement was more common followed by right hip. We had one patient with bilateral involvement. It is contrary to study by Bennett; where he found that right hip (57%) involvement was predominant [13].

In our study septicemia was commonest associated condition. In many of our patients there were more than one risks factors likes septicemia, low birth weight, jaundice and ventilator support. Due to that one neonate having more than one risks factor and the number of patients is more than actual.

Out of 16 infants and neonates, all had NICU admission. One infant who presented at age of 7 months had no previous hospitalization. These suggest that NICU admission increases risk of sepsis.

Table 2: Distribution of the study population according to blood investigations.

	< 1 Year	> 1 Year
Total count	**n=16**	**n=8**
Normal (<12000 per ml)	12 (75%)	03 (38%)
Elevated (>12000 per ml)	04 (25%)	05 (62%)
ESR	**n=6**	**n=7**
Normal	01 (16.6)	01 (14.3)
Elevated	05 (83.4)	06 (85.7)
C-Reactive Protein	**n=16**	**n=8**
Normal	03 (18.7)	Nil (0.0)
Elevated	13 (81.3)	08 (100.0)
Suspension test	**n=16**	
Positive	16 (100.0)	
Negative	NIL	

In this study 75% infants & neonates had normal leukocyte count (Ranging from 6800 – 12000 per ml). In older children 62% patients had elevated count (Ranging from 12,500 – 27,800 ml). It was similar to study by Bennett [13].

In our study average ESR was 45mm per hour with a range from 20 to 100mm per hour. About 85% patients were with high ESR. It was similar to study by Klein, where he found that 95% presented with ESR greater than 20mm per hour [14].

In our study about 21 patients had high CRP level on admission irrespective of age which was similar to study by Khachatourians which they found 88% had an elevated CRP on admission [15]. Normal CRP was seen in 3 patients they were very late presented cases.

Suspension test was performed in all infants & neonates. It was positive in all the infants & neonates. This makes it very useful to diagnose septic arthritis of hip.

Table 3: Distribution of the cases according to radiological and ultra-sonography findings.

	< 1yr. No. (%)	>1yr. No. (%)
Increase joint space		
Present	12 (75.0)	NIL
Absent	04 (25.0)	08 (100%)
Radiological Finding		
Normal	02 (12.5)	08 (100.0)
Subluxation	12 (75.0)	NIL
Joint Effusion		
Present	11 (68.8)	08 (100.0)
Absent	05 (31.2)	NIL
Synovial thickening		
Present	13 (54%)	08 (33%)
Absent	03 (13%)	NIL
Subluxation/dislocation		
Present	04 (44.4)	NIL
Absent	05 (55.6)	NIL

Generally radiological finding were normal in older children. Radiological changes in form of widening of joint space were seen in 12 (75%) infants and neonates.

In our study Subluxation/Dislocation was found in around 85% patients below 1 year of age. There was no subluxation/dislocation in older children.

In our study 79% patients had joints effusion on sonography irrespective of age. Other positive finding like subluxation/dislocation and bony erosion were seen in infants & neonates with late presentation.

We found that USG is very useful non invasive diagnostic method for septic arthritis.

Table 4: Distribution of the cases according to operative treatment.

Treatment	Aspiration	
	< 1yr. No. (%)	>1yr. No. (%)
Aspiration		
Done	12 (75.0)	07 (87.5)
Not Done	04 (25.0)	01 (12.5)
Arthrotomy		
Done	09 (56.3)	08 (100.0)
Not Done	07 (43.7)	NIL

In our study in 79% patients we had done aspiration. Of that in 71% patients we had done arthrotomy because joint effusion was present on USG and aspiration was also positive.

We generally gave two weeks of IV antibiotics, and then patients were put on oral antibiotic after CRP level were normal. Oral antibiotics were continued for another two weeks until hematological levels were normal.

In our study 13 patients were given spica which was kept for 2 to 4 weeks in 7 patients & more than 4 weeks in 6 patients. This was depending on per operative instability of hip. Generally in older children spica was not required.

In our study we had average follow up of 30 months (Ranging from 8 months to 48 months).

In our study at final follow up none of the patients had pain on activity of daily living.

Table 5: Distribution of the cases according to results.

	< 1yr. No. (%)	>1yr. No. (%)
Limb length		
Normal	14 (87.5)	08 (100.0)
Shorting	02 (12.5)	NIL
Range of Motion		
Full	14 (87.5)	08 (100.0)
Restricted	02 (12.5)	NIL
Overall Result according to Bennett Criteria		
Excellent	05 (31.2)	08 (100.0)
Good	03 (18.8)	NIL
Fair	05 (31.2)	NIL
Poor	03 (18.8)	NIL
Result According to Bennett Criteria (Infants & Neonates with Time of presentation)	< 1wk.	>1 wk.
Excellent	03 (100.0)	02 (15.4)
Good	NIL	03 (23.1)
Fair	NIL	05 (38.4)
Poor	NIL	03 (23.1)

In our study two patients had shortening. In both patients it was due to avascular necrosis femoral head with epiphyseal damage.

In this study we found normalization of movement comparable to normal side in most of our patients. Restriction of movements mainly flexion and abduction was seen in two patients. Internal rotation was restricted in one patient who had avascular necrosis of head of femur. All patients with restricted movements had delay in presentation.

In our study 13 patients (54%) who had excellent results in those 08 patients were older children, while 5 patients were infants and neonates. Fair & poor results were more common in infants & neonates who presented late. This is in concurrence with finding by Morrey *et al* who found that patients presenting in 4 days had satisfactory outcome [16, 17].

Conclusion

Early diagnosis and early adequate treatment is the key to successful treatment that can prevent the crippling sequelae, especially when the joint of an infant is involved. In our study majority of the patients were infants & neonates. It shows that infants & neonates are the high risks for septic arthritis of hip.

1. In our series 94% infants and neonates had NICU admission. Hence we recommend that all NICU neonates should be handling with strict aseptic precaution. Suspension test was positive in all the infants and neonates having septic arthritis of hip. This makes it very useful screening test. So we feel that all NICU neonates should be daily screened to diagnosis early. And early treatment should be started to prevent complications.
2. Leukocyte count was normal in 75% patients below 1 year of age. While elevation of count was seen in older children. This shows that WBC count is not a reliable indicator especially in infants & neonates. In this series elevated CRP was seen in 88% patients irrespective of age. So we feel that CRP is the most sensitive index of infection and should be done in every suspected cases of septic arthritis especially in early presentation.
3. In our study we had not sent blood culture of 8 patients because they presented late to us and were already on antibiotics for long time. Negative blood culture was seen in more than 50% patients, probably because they were already on antibiotics. So we recommend that blood culture should be sent in all suspected cases before starting antibiotics.
4. On USG joint effusion and synovial thickening was present in majority of the patients. Subluxation/ dislocation with bony involvement were seen in late presenting cases. As USG is cost effective and has no radiation hazards it can be done repeatedly. This makes it a very useful tool in diagnosing in early as well as in late cases and should be done in all suspected cases.
5. MRI is a costly investigation and requires anesthesia for the procedure. We feel that it should be reserved for the patients when diagnosis is in dilemma. It's also useful to know the condition of epiphysis in late presentation.
6. Anterior arthrotomy should be prefer as whole joint can be decompressed thoroughly as well as we can preserve the vascularity of femoral head. Drill hole can be done easily in femoral neck to see proximal femoral osteomylitis. Post-operatively Spica/splint is advisable in unstable hip should be kept until hip became clinically and radio logically stable.
7. It is widely known that time of presentation is the most important factor for good prognosis. In our study patients presenting before one week had satisfactory outcome while those who presented after one week had

unsatisfactory outcome. Sequelae were generally more commonly seen in infants and neonates rather than older children. So this obviously shows that early diagnosis and timely treatment is crucial in determining prognosis especially in infants and neonates.

Authors' contribution: C.N conceived the idea, collected data, analyzed and prepared the initial draft of the paper. N.P supervised the data collection and provided support, encouragement and administrative help to carry out this study. M.H and C.V helped in analysis and drafting the manuscript.

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