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To study epidemiological pattern and clinical and radiological parameters of recovery of septic arthritis in infants and neonates admitted in B.R.D medical college, Gorakhpur

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Abstract

Introduction: Prior to the antibiotic era and more enlighten surgical approaches, the occurrence of septic arthritis presented literal threat to life and limb. Despite potent antibiotics, Septic arthritis continues to be one of the most damaging and prevalent form of arthritis. Septic arthritis is bacterial infection of synovium and subsequently all the structure within the joint, which causes intense inflammatory reaction, possibly leading to destruction of articular cartilage and later of the complete Joints.

Case Presentation: A diagnosis of septic arthritis was explicitly assigned when a patient had a positive Gram stain or culture finding of joint fluid, purulent joint aspiration drawn from a joint adjacent to a site with known osteomyelitis, focal joint involvement in the setting of bacteremia. If no growth was observed during culture, we presumed a diagnosis of septic arthritis when 2 of the major and 5 of the minor clinical criteria described by Morrey *et al.* were satisfied and the diagnosis was supported by ultrasonographic findings.

Conclusion: The incidence of septic arthritis in children < 1 year is 1.65 per 1000 children, 8.37 per 10,000 infants and in neonates its 2.80 per 1000. Males are most commonly affected with male: female being 3: 1. Hip is commonest involved joint. Commonest organism responsible for septic arthritis is Staphylococcus. The major cause of late presentation and/or delayed initiation of definitive management in septic arthritis is handling of the patients by non-orthopaedics specialist initially. Identified risk factors in this study are prematurity, perinatal hypoxia, septicemia, birth trauma and venous catheterization. Most of the clinical improvement occurs during first 6 weeks. Radiological improvement lags behind clinical improvement by 2-4 weeks. Most important prognostic factors for poor outcome are late presentation and /or delayed initiation of definitive management.

Keywords: Osteomyelitis, bacteremia, septic arthritis, septic arthritis

Introduction

Prior to the antibiotic era and more enlighten surgical approaches, the occurrence of septic arthritis presented literal threat to life and limb ^[1]. Despite potent antibiotics, Septic arthritis continues to be one of the most damaging and prevalent form of arthritis. Septic arthritis is bacterial infection of synovium and subsequently all the structure within the joint, which causes intense inflammatory reaction, possibly leading to destruction of articular cartilage and later of the complete joint.

Failure to recognized septic arthritis results in a high social and economical burden ^[8]. Delayed diagnosis leads to worst outcomes ^[9]. Furthermore strong correlation exists between the severity of residual deformity and age at presentation ^[10, 11, 12]. Early diagnosis and treatment associated with good outcome but the kind of therapy is still controversial. A cross sectional prospective study was performed to identify risk factors of septic arthritis in infants and it's clinical and radiological outcome after arthrotomy of the affected joint.

Aims and objectives

- To study epidemiological pattern of septic arthritis in infants admitted in B.R.D. Medical College.
- To study clinical and radiological parameters of recovery.
- To study the risk factors associated with septic arthritis

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Material and Method

This is a cross-sectional hospital based prospective, clinical, observational study. The study is carried out in B.R.D. Medical College and associated Nehru Hospital, Gorakhpur, over a 12 months period (1st July 2015 - 30th June 2016) of 20 patients with proven and suspected septic arthritis. The study was explained to the mother and/or guardian and written consent obtained in English and Hindi- the local language.

The inclusion criteria

1. Neonates and infants with at least one of the following risk factor
 - History of fever.
 - Hospital stay more than 7 days.
 - Joint pain and swelling.
 - Neonates admitted for asphyxia, sepsis, low birth weight, prematurity
2. Neonates and infants born in B.R.D. Medical College and out born.

Exclusion Criteria

- New born babies born with gestational age less than 28 weeks.
- Neonates with birth weight less than 1000gm.
- Neonates with several congenital anomalies.
- Still born and fetal death.
- Post dated Neonates.
- Hospital stay less than 7 days.

A diagnosis of septic arthritis was made when a patient had a positive Gram stain or culture finding of joint fluid, purulent joint aspiration drawn from a joint adjacent to a site with known osteomyelitis, focal joint involvement in the setting of bacteremia. If no growth was observed during culture, we presumed a diagnosis of septic arthritis when 2 of the major and 5 of the minor clinical criteria described by Morrey *et al.* [10]. were satisfied (Table 2) and the diagnosis was supported by ultrasonographic findings.

Table 1: Morrey's Diagnostic Criteria

Criteria	Criteria
MAJOR CRITERIA	Pus aspirated from the joint.
	Marked elevation of erythrocyte sedimentation rate (ESR).
	Specific roentgenographic changes in the involved site.
MINOR CRITERIA	Fever greater than 38.3°C(101°F)
	Joint pain made worse by gentle passive motion.
	Swelling of involved joint
	Systemic symptoms of lethargy, malaise, irritability
	No other demonstrable pathological process
	Satisfactory response to antibiotic therapy

All patients' clinical notes were put in structured fashion using standard proforma. Clinical data are represented by fever, articular pain, hydrarthrosis, painful limitation of joint mobility, pain on palpation of limb, pseudo paralysis of the interested limb, flush and erythema of overlying skin. The following data were assessed for all patients included in the study: gender, age, underlying diseases including prematurity, duration of symptoms before operation, changes of the joint in preoperative X-ray, concomitant osteomyelitis of the adjacent bone, elevation of erythrocyte sedimentation rate (ESR) and

C-reactive protein (CRP), development of sepsis, intraoperative pus drainage, synovial fluid culture, and infecting organisms, ultrasonography findings.

After thorough clinical examination, blood test was performed. The investigations included haemoglobin estimation, Total and differential leukocytes count, Erythrocyte sedimentation rate (ESR), C-reactive proteins (CRP) and blood culture. The X-ray of affected joint is taken in both anteroposterior view and lateral view followed by ultrasonography of the joint.

Table 2: Blantyre Septic Joint Score (BSJS)

Parameter	Grade	Score	Explanation
Swelling	Gross	1	Gross swelling
	Moderate	2	Clear swelling, obvious without comparison to the other side
	Minimum	3	Just perceptible swelling(usually needs comparison with other side to detect it)
	None	4	Normal joint
Tenderness	Marked	1	Severely tender, cannot tolerate palpation
	Moderate	2	Obvious tenderness but tolerate palpation
	Minimum	3	Slightly more tender than the other side
	None	4	No tenderness
Range of movement	None	1	None or virtually no movement (less than 10% normal range)
	Minimal	2	Some movement (11 - 50%)
	Moderate	3	A reasonable range but not full (51 - 90%)
	Full	4	Normal range of movement
Function	None	1	No function in activities involving the joint
	Minimal	2	A little function but severe restriction of activity involving the joint
	Moderate	3	Fairly good function but not normal
	Full	4	Normal

Aspiration

In doubtful cases of septic arthritis with minimal joint fluid, aspiration of the joint is done. Aspiration is done under general anesthesia. The patient's skin surrounding the affected joint was cleaned with povidone iodine aqueous solution then surgical spirit (ethanol) then allowed to dry to reduce contaminants. The operator was masked and wearing sterile gloves. A sterile 18 gauge needle and syringe were used. The following anatomical approaches were used. The aspirated fluid sent for Gram staining, culture and sensitivity.

Shoulder

An anterior approach to the joint was made, inserting the needle below and lateral to the coracoid process.

Hip

The needle was inserted carefully from the lateral side of the thigh just anterior to the greater trochanter, in a superior and medial direction along the femoral neck,

Knee

A lateral retro patellar approach was used.

Arthrotomy

Once the diagnosis of septic arthritis made, the arthrotomy of affected joint is done as early as possible. Arthrotomy was carried out in a operation theatre under general anesthesia. Preoperative preparation of the skin is done with help of aqueous povidone iodine solution and surgical spirit. The joint was draped with sterile towel. All aseptic precautions were taken to prevent contamination. The following surgical procedure were used.

Shoulder

For the arthrotomy of shoulder joint, anterior deltopectoral approach was used. The patient was placed in a supine position on the operating table. A 2-3 cm straight incision was made, following the line of the deltopectoral groove. The incision began just above the coracoid process. Blunt dissection done to split the deltoid and pectoralis major fibres, then the subscapularis fibres, then sharp dissection if necessary to divide the capsule.

Hip

For the hip joint, anterior approach (Smith Peterson approach) was used as it is more safe and avoid soft tissue injuries posterior to hip joint. A skin incision was made starting from anterior superior iliac spine (ASIS) extending proximally along anterior half of iliac crest and 3cms distally vertically downwards directed towards lateral border of patella. Internervous plane is created between sartorius and tensor fascia lata. Blunt dissection carried to deep between rectus femoris and gluteus medius muscle. Fibres of reflected head of rectus femoris retracted to expose joint capsule. Arthrotomy performed, pus collected and sent for laboratory investigations. Hip joint is thoroughly irrigated with normal saline and capsule is closed over suction drain. Wound is closed.

Knee

For the knee joint, medial parapatellar approach was used. Skin incision was given along the medial border of patella. After incising joint capsule, joint is irrigated with normal saline. Wound is closed over drain. If there was found to be no pus in the joint then the patient was withdrawn from the study as

there was no evidence of septic arthritis. As soon as pus was removed from the joint it was sent to the laboratory in a sterile container for microscopy, culture and sensitivity, and the patient was started on intravenous antibiotics. All the infants were put on empirical intravenous antibiotic therapy for initial 2 - 3 days. Empirical antibiotics therapy included Vancomycin, Gentamycin, newer generation fluoroquinolones and linezolid. A targeted antibiotics were started as soon as the joint fluid or blood culture reports were available. Intravenous antibiotics started in theatre were continued for 72 hours then changed to oral if the temperature was normal. If the child remained with a fever then intravenous antibiotics were continued for five days. Monitoring of the infants were done daily for the assessment of temperature, swelling, drainage from the joint and general health. The drain was removed on 3rd post operative day and stitches were removed on 10th post operative day. In cases of septic arthritis of hip and knee, card traction was applied. In septic arthritis of shoulder, arm chest strapping was done. Patients were allowed to go home when they satisfied the discharge criteria which was

- Patient afebrile.
- Decrease joint swelling.
- Joint non tender to touch.
- Increase active movement of joint.

At the time of discharge patient was put on oral antibiotics for a period of 4 weeks.

After discharge the patients were reviewed in a special research clinic at 2, 6, 12, 24, and 52 weeks. At each attendance X rays were taken, septic scoring of the affected joint was done using the BSJS, and full blood count, ESR and CRP were repeated.

Observation

During the study time from 1st July 2015 to 30th June 2017, during this time twenty patients (22 joints) with septic arthritis were registered. Of the total 20 cases, 14 cases (70%) were neonates and 6 cases were (30%) infants. During the period, total 12,156 children less than one year were admitted in the hospital, of which 4,992 were Neonates and 7,164 were infants. Males are affected more than females. The age of the patient at the time of admission was between 4 days and 4 months with mean 29.5 days and standard deviation of 24.37 days. Age at birth Of the total 20 patients admitted, Fourteen were full term infants (38 week - 42 weeks) and six infants were premature (less than 38 weeks). Out of the 20 cases, 7 cases born via cesarean delivery and 13 cases were born via normal spontaneous vaginal delivery. The delay between the start of symptoms as reported by the guardian and presentation to orthopedic unit varies from 3 days 8 days, with mean 4.7 days with standard deviation of 1.94 days. Thirteen of them (65%) presented within 5 days of onset of symptoms while seven patients (35%) presented more than 5 days in orthopedic unit. No of patients with antibiotics history before admission out of the 22 joints involved the hip joint was most commonly involved joint. Followed by knee and shoulder. Mono articular involvement was seen in 18 cases (90%) and poly articular only in 2 cases (10%). Both the cases were neonates with bilateral hip involvement. Distribution of left and right sided septic joints and upper and lower limb joints. 17 out of 20 cases (85%) in the study had sepsis in lower limb joint. The right side was more commonly involved with 11 cases (55%) as compare to left side with 7 cases (35%). Bacteriological culture grown in the joint fluid. The

number of patients with 'no growth' on blood culture is higher than for joint fluid culture. However the spectrum of organisms grown on blood culture is similar to that seen from joint fluid culture. Blood culture in septic arthritis has low rate of bacterial isolation. Only 30% (6/20) patient having positive blood culture. However of those 6 patients with positive blood culture, in 66.7% (4/6) there was positive correlation with joint fluid culture. Correlation is high for *Staphylococcus aureus*. At the time of admission, elevation of erythrocyte sedimentation rate (ESR) above 40 mm/hr in the first hour was seen in 17 cases (85%). Mean ESR was 47.15 mm/hr with range 20-112 mm/hr and standard deviation of 24.72. In this study at the time of admission, out of total 20 cases, TLC of 15 cases (75%) was $>12,000$ cells/mm³, range being 10,500 to 25,100 cells/mm³, with mean and standard deviation being 16,200 cells/mm³ and 5.01 respectively. The Hb values on the day of admission were in the range of 7.6 mg/dl to 13.1 mg/dl with mean of 10.3 mg/dl and standard deviation of 1.41 mg/dl. Of the 20 cases, 9 cases (45%) had Hb < 10 mg/dl. At the time of admission, CRP value ranged from 1.3 - 24.8 mg/dl. Out of 20 cases, 18 cases (90%) had CRP value > 2 mg/dl and only 2 cases (10%) had less than 2 mg/dl. The level of C-reactive proteins were gradually decreases over time. Blantyre Septic Joint Score Temperature study, only 12 cases (60%) had temperature > 38.3 °C. Temperature in the admitted cases were in the range of 37.6 - 39.4 °C. Mean temperature at the time of admission was 38.5 °C with standard deviation of 0.59 °C. 14 patients (70%) cases had one or more risk factors while 6 cases (30%) there were no identified risk factors.

Discussion

Septic arthritis is an important rheumatological and orthopedic emergency and continues to be associated with significant morbidity and mortality, even after effective treatment. In cases of neonates and infants it is very difficult to diagnose septic arthritis as there is paucity of clinical signs and symptoms. Septic arthritis occur most frequently in extreme of ages, more commonly in children than elderly. In this study it has been shown that septic arthritis is more common in neonates (70% cases) than in infants (30% cases). In this study, there were more males (75%) than females (25%) affected which is similar to the study carried out by Al Saadi *et al.* comprising of 65 patients. In their study they found that male: female ratio being 2.4: 1 which is comparable to 3:1 found out in our study. The reason behind the higher male affection still remained unknown. In this study many cases (80%) were initially managed by non orthopedic personal, therefore, most of the diagnosis were missed as well as proper management was not applied and usually referred to orthopedic units, when early chance for better management was lost. In this study almost all the patients presented with joint tenderness, decrease range of motion and pain on passive movement. 75% cases had joint swelling, 45% had increased local temperature and 35% cases had erythema of the skin overlying the joint. Fever was not a consistent finding during this study. 12 cases (60%) had temperature > 38.3 °C. This is similar to the study carried out by Issa S. in 2001 where they found fever in 80.7% of cases. The reason behind low percentage may be inability of the infants to mount appropriate response against bacteria resulting in decrease temperature. Thus the absence of fever does not rule out the diagnosis. A large number of patients (70%) were given antibiotics before presentation to orthopedic units, this unnecessary use of antibiotics may mask

the clinical picture, may cause severe adverse effects such as fatal anaphylactic shock. It was one of the main reason behind negative joint fluid and blood culture reports. Total leukocyte count found to be $>12,000$ cells/mm³ in 75% cases while erythrocyte sedimentation rate was > 40 mm/hr in 85%. According to the study of Kallio *et al.*, only 60% of cases had leukocyte count greater than 12,000/mm³ on admission. While Kenneth T. *et al.*, showed that in 53.8% of the patients had ESR >40 mm/hr. Many investigators have shown that TLC and ESR are unreliable marker of septic arthritis (14). Blood culture reports were positive in 30% of patients and was the only source of microorganisms in 10% of cases. It is particularly use full when synovial fluid is not available for analysis. This study showed that *Staph aureus* was the most common organism in 41% cases followed by *Streptococcus* in 20% of cases. Clinical evaluation was done using Blantyre Septic Joint Score (BSJS). This measures a combination of swelling, tenderness, range of motion and function. Majority of clinical improvement happening in the first two weeks then smaller degree improvement between two to six weeks then minimal improvement after six weeks. In this study, 65% of the cases showed one or more radiological changes in the x ray. These included increase in joint space 60%, osteomyelitis 10%, Sub luxation 20% periosteal reaction 35%. All the patients had good radiological outcome except in 10% cases which showed dislocation of the joint.

Conclusion and Summary

- The incidence of septic arthritis in children < 1 year is 1.65 per 1000 children, in infants its 8.37 per 10,000 infants and in neonates its 2.80 per 1000.
- Males are most commonly affected with male : female being 3: 1
- Hip is commonest involved joint.
- Commonest organism responsible for septic arthritis is *Staphylococcus*
- The major cause of late presentation and/or delayed initiation of definitive management in septic arthritis is handling of the patients by non-orthopaedics specialist initially.
- Identified risk factors in this study are prematurity, perinatal hypoxia, septicemia, birth trauma and venous catheterization
- Prior use of antibiotics is the most common cause of culture negative result.
- Most of the clinical improvement occurs during first 6 weeks. Radiological improvement lags behind clinical improvement by 2-4 weeks.
- Most important prognostic factors for poor outcome are
 - Late presentation and /or delayed initiation of definitive management.
 - Associated osteomyelitis of adjacent bone.
 - Hip joint involvement.

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