Evaluation of etiologies and results of treatment of septic arthritis of large joints in patients under 5 years old as a phenomenon needs emergency intervention

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Abstract: Objective: The basic goal of study is to determine the etiologies and treatment results of septic arthritis of shoulder, hip and knee joint in patients under 5 years old. Other purposes were estimation of the predisposing factors in development of septic arthritis, determination of frequency of clinical signs and symptoms in patients, determination of male-female ratio, estimation of importance of laboratory studies and most importantly evaluation of complications.Method and material: We studied 56 patients (under 5 years) who having septic arthritis in shoulder, hip and knee in Shohada Hospital between 2000-2005 years. We gathered the necessary information in a previously provided check list form. Patients were evaluated pre-operatively and post-operatively. Results: 56 patients, under 5 years ;(female: 17, male: 39) were treated for septic arthritis of the joints shoulder, hip and knee. 17 patients had knee septic arthritis, 33 patients had hip septic arthritis and 6 patients had shoulder septic arthritis. Staphylococcus aureus was the most common organism on all age groups .A good result has been found with arthrotomy with antibiotic therapy in these patients .In general predominance among males is evident. Conclusion: Although joint infections are quite common; the diagnosis of septic arthritis is not always straight forward. The most important goal in treating of septic arthritis is to confirm diagnosis and if possible identify the specific pathogen involved. Prompt arthrotomy and prompt evaluation of purulent joint fluid appears to be crucial both for preservation of articular cartilage and for resolution of the infection.
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Short title: Evaluation of etiologies and results of treatment of septic arthritis

Introduction:

Bone and joint sepsis is a relatively common disorder especially in pediatric population. Infectious arthritis, or suppurative or septic arthritis, is a serious bacterial infection of the joint space that in children results from hematogenous dissemination of bacteria (1, 2).

This makes it likely that all orthopedic surgeons will be faced with the problem in diagnosis and treatment of these disorders. Thus, in any child with fever, undefinable clopping, abnormal gait, abnormal position of the limbs and muscular pain especially with swelling and erythema, doubt for septic arthritis should be considered (3).

It is caused by bacterial, viral, and fungal infection, but the disease behaves the same but it is mostly caused by Bacteria. Even with the currently available antibiotics and treatment regimens, serious complications may results delay as diagnosis and failure to begin treatment promptly are the most common reasons for late complications of infection like Dislocation, Epiphyseal destruction, Growth disturbance, Ankylosis, Secondary osteoarthritis, Osteomyelitis , abscess and sinus. Thus early accurate diagnosis and managing the patients are very important.

Infection is caused by dissemination of pathogens via the blood, from distant site (most common), from an acute osteomyelitis focus, from soft tissue infection, via penetrating trauma and via iatrogenic means. It is caused by some microorganisms. The causal organism is usually Staphylococcus aureus. In children under the age of 3 years Haemophilus influenza is fairly common. Others are Gram-negative bacilli (a group of bacteria,

including Escherichia coli, or E. coli) and Streptococci

Pathology is an acute synovitis with a purulent joint effusion and Synovial membrane becomes edematous, swollen and hyperemic, and produces increase amount of cloudy exudates contains leukocytes and bacteria. As infection spread through the joint, articular cartilage is destroyed by bacterial and cellular enzymes. The joint may be become pathologically dislocated.

Typical features are acute pain and swelling in single large joints, commonly the hip in children and the knee in adults; however any joint can be affected. The most commonly involved joint is the knee (50% of cases), followed by the hip (20%), shoulder (8%), ankle (7%), and wrists (7%). Inter-phalangeal, sternoc-lavicular, and sacroiliac joints each make up 1-4% of cases.

The typical features of suppurative arthritis include: Erythema, warmth, swelling, tenderness over the affected joint and Palpable effusion, Decreased range of movement. Small joints, such as those of the hand, usually are involved after penetrating trauma and closed fist injuries.

Features in children include: Acute pain in single large joint, swelling in the joint (if superficial), warmness and tenderness, Fever. Also all movements are restricted due to muscle spasm (Pseudo-paresis).

Findings in physical exams are: Decreased or absent range of motion, Signs of inflammation: joint swelling, warmth, tenderness and erythema, Joint orientation as to minimize pain (position of comfort):

- ✓ Hip: abducted, flexed and externally rotated.
- ✓ Knee, ankle and elbow: partially flexed.
- ✓ Shoulder: abducted and internally rotated

In order to diagnosis some Investigations are used, containing:

- ✓ ***Lab studies:*** The diagnosis can usually be confirmed by joint aspiration and immediate microbiological investigation of the fluid. Blood culture may be positive in about 50% of proven cases. Nonspecific features of acute inflammation-leukocytosis (50,000/µL, neutrophils more than 75%), ESR, CRP-are suggestive but not diagnostic.
- ✓ ***Imaging studies:***

1-Plain x-ray:

The appearance of significant x-ray findings depends upon the duration and virulence of infection. Plain radiography findings are generally nonspecific and may reveal only soft tissue swelling, widening of the joint space (due to the effusion), and peri-articular osteoporosis during the first 2 weeks. Later, when the articular cartilage is attacked, the joint space is narrowed.

2-Ultrasonography

This study is very sensitive in detecting joint effusions generated by septic arthritis. Ultrasound helps to differentiate septic arthritis from other conditions (e.g., soft tissue abscesses, tenosynovitis) in which treatment may differ.

3-Radio-isotope bone scan:

Show increase uptake of the isotope in the region of the joint.

4- CT scan:

This study may help to diagnose sterno-clavicular or sacroiliac joint infections.

5-MRI:

MRI is most useful in assessing the presence of peri-articular osteomyelitis as a causative mechanism.

The first priority is to aspirate the joint and examine the fluid; treatment is then started without further delay. Analgesics and splinting of the involved joint in the position of maximal comfort alleviate pain. Fluid replacement and nutritional support may be required. Intravenous antibiotics should be given empirically and started as soon as joint fluid and blood sample have been taken for culture. Even with the currently available antibiotics and treatment regimens, serious complications may results delay as diagnosis and failure to begin treatment promptly are the most common reasons for late complications of infection? Thus early accurate diagnosis and managing the patients are very important (1).

Due to the importance of on time diagnosis and treatment of this disease, we tried to find an effective treatment method to overcome its terrible phenomenon. The basic goal of this study is to determine the etiologies and treatment results of septic arthritis of shoulder, hip and knee joints in patients under 5 years old. Other purposes were estimation of the predisposing factors in development of septic arthritis, determination of frequency of clinical signs and symptoms in patients, determination of male-female ratio, estimation of importance of laboratory studies and most importantly evaluation of complications of septic arthritis.

Materials and Methods:

In prospective Analyzed Descriptive Study, we studied 56 patients (under 5 years) who were diagnosed septic arthritis of shoulder, hip and knee joints in Shohada Trauma and orthopedic Center on Tabriz University of medical sciences between 2005-2010 years (The end of June, 2010) .

We gathered the necessary information from a previously provided check list forms. Patients were evaluated pre-operatively and post-operatively on last control time. Follow up was done in physician's office. Study Variables were age, Sex, Clinical

Manifestations, radiological and Laboratory findings, Findings in first examination, treatment and complications. Statistical analysis was performed by SPSS software package version 12.0 for windows. Quantitative data were presented as mean ± standard deviation (SD), while qualitative data were demonstrated as frequency and percent (%). In order to statistical analysis, collected quantitative data were studied with Student T-test (independent Samples), paired samples T-test and Man - whitney U test and for Qualitative data statistical methods, the mean difference test for independent groups, and Chi Square[2] test or Fisher's exact test. P value less than 0.05 was statistically considered significant in all steps.

All participants have signed a written consent, and the study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), which was in compliance with Helsinki Declaration.

Results:

39 patients (69.7%) were male and 17 (30.3%) were female. Mean age in all patients was 1.19. Knee joint was infected in 17 patients (30.3%), Hip was infected in 33 patients (85.9%) and Shoulder joint was infected in 6 patients (10.7%) (Table1), while these frequencies were different with sex distribution. In males, Knee joint was infected in 11 patients (28.2%), Hip was infected in 25 patients (64.1%) and Shoulder joint was infected in 3 patients (7.6%). In females, Knee joint was infected in 6 patients (35.2%), Hip was infected in 8 patients (47%) and Shoulder joint was infected in 3 patients (17.6%) but, There was no significant difference between males and females (P value=0.636).

Mean age in patients with Knee, Hip, and shoulder septic arthritis were 2.31, 1.98 and 0.92 years of old. There was no significant difference between the age ranges (P value=0.69).

In all patients Joint fluid aspiration was done at first. Results were positive in 19 patients (33.9%). Staphylococcus aureus was the most prevalent microorganism, in 18 patients (32.1%). Homophiles Influenza followed Staphylococcus aureus in prevalence, with 2 patients (3.6%). Etiology was unknown in 36 patients (64.3%) while culture was negative in these patients (Table2). 19 patients (33.9%) had Trauma history in their background. In 5 patients (8.9%) an infection in other parts was seen.

On the basis of clinical manifestations, Pain in joint and Clopping were prevalent causes of the reference. Other causes were fever, swelling, tenderness and decreased range of motion of the joint especially in abduction.

Other manifestations were: Fever in 29 cases (66.8%), Swelling in 12 cases (21.4%), Pain and Tenderness in 55 cases (98.2%), only in one patient there was no tenderness, Decreased range of motion (ROM) specially in abduction in 54 cases (96.4%). only in two patients there was no decreased ROM.

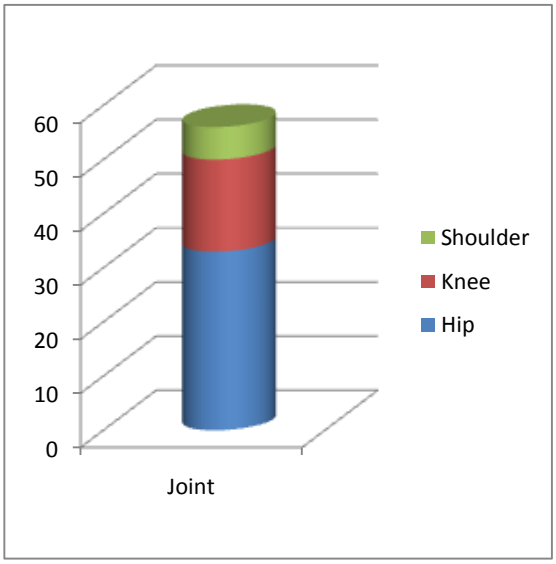

Table 1. Infected Joint

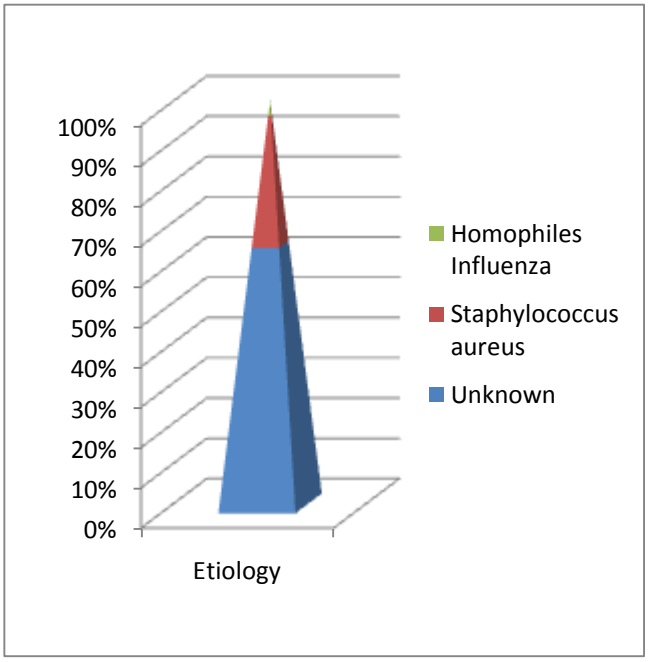

Table 2. Etiology

Radiologic findings showed: Swelling in Soft tissue in 24 patients (42.8%, as the most common finding), inflammation in bone and bone marrow in 4 cases (7.1%). In 28 patients there was no evidence of radiologic changes.

Laboratory test showed: Increased ESR in 45 cases (80.3%), Leukocytosis (More than 10000) in 29

cases (51.7%). PMN frequency was between 70-85% in all patients. CRP was positive in 48 cases (85.7%). Blood Culture (B/C) was positive in 13 cases (23.2%), while 7cases of patients with hip septic arthritis had positive B/C (21.2%) (Table 3). There was no significant difference between Positive or negative B/C and infected joint. (P value=0.935).

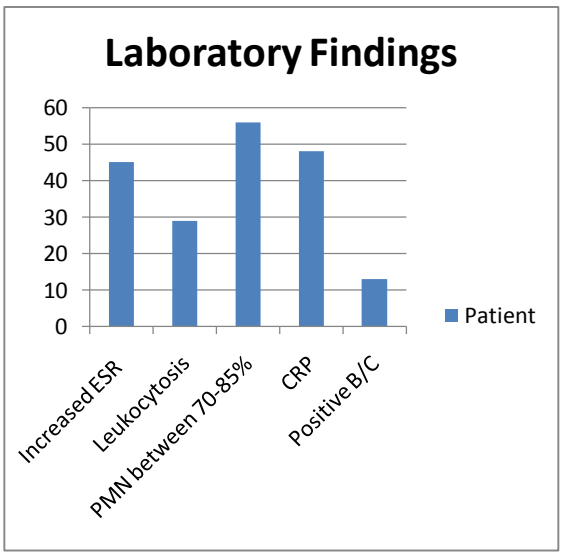

Table 3

8 Patients had the history of recent Antibiotic therapy (32.1%). Arthrotomy was done in 22 cases (39.2%) in first 24 hours before starting the signs and in 34 cases (60.8%) after 24 hours. Fluid Culture was positive in 7 cases (41.2%) in knee cases and in 13 cases (39.4%) of hip cases but, There was no significant difference between Positive and negative culture. (P value=0.66).

In all patients Arthrotomy and antibiotic therapy were done. Combination of cefazolin + Gentamycin was used in 44 cases (78.5%) and Ceftriaxone + cloxaciline in 12 cases (21.5%) (Table4).

After treatment, pain was seen in 17 patients (30.3%), decreased ROM was seen only in 13 patients (23.2%) and changes in bone were seen in 8 patients (14.3%). Also dislocation in joint was seen only in 2 patients (3.5%) and ankylosis was seen in 2 patients (3.5%). (Table5)

Discussion:

Osteomyelitis and septic arthritis are common diseases in children. Earlier diagnosis and sufficient and on time treatment are so important in its prognosis. Most common manifestations in children are; Fever, swelling, pain, tenderness and limitation in ROM. On the basis of our results 98.2% of patients had pain in infected joint and 38.1% of them were referred with body temperature (BT) more than 38.1°C. Totally, Pain in infected joint is the most common manifestation (1).

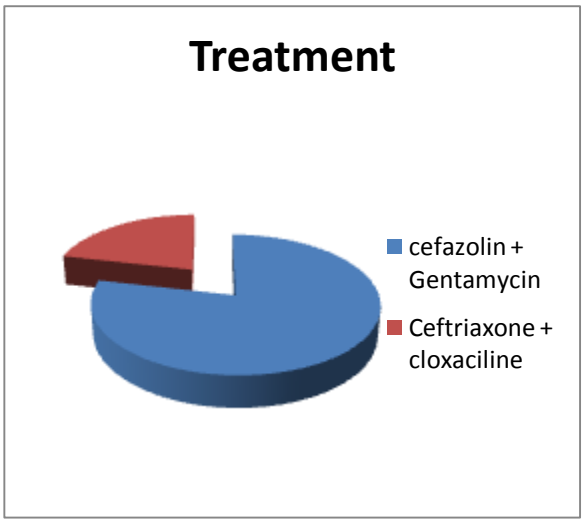

Table 4

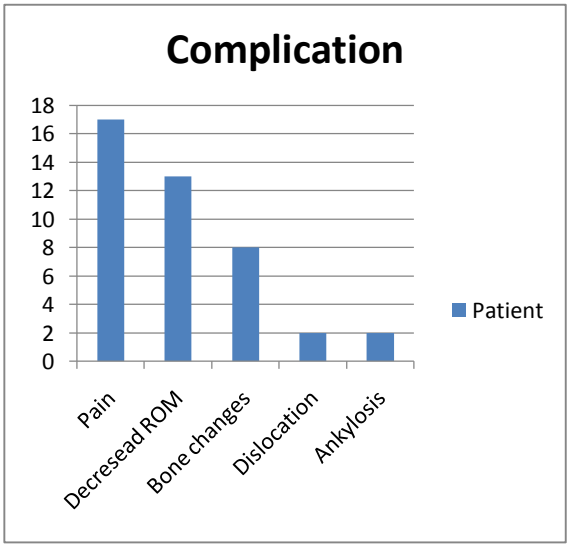

Table 5

In a study on 116 patients diagnosed as septic arthritis by Scott et al it is showed that 30% of the patients had a history of bacteremia and only 36% of the patients had BT more than 37.5°C (4).In another study by Ho.G on 25 patients, 24% of them had BT more than 37.5°C (5).

Having a history of Trauma is common in children with Osteomyelitis and septic arthritis, that causes delay in diagnosis sometimes (4). In our study 22 patients had this background.

In all of the patients blood culture and gram straining should be done. Involved pathogen in septic arthritis is age dependent. The causal organism is

usually Staphylococcus aureus in all ages, but in children under the age of 3 years it is the second organism. In these ages we should consider Gram Negative organisms in first stage (1, 7, and 8).

In childhood Haemophilus influenza is more common. It is so important because 20% of the patients infected by Haemophilus influenza are diagnosed as Meningitis (9). In recent years infection by Haemophilus influenza is decreased but infection by another gram negative bacteria named Kingella Kingate is increased (10).

Confirming other studies, Staphylococcus aureus was the most prevalent microorganism in our study. Staphylococcus aureus was seen in 18 patients (32.1%) while Homophiles Influenza was seen in 2 patients (3.6%) that all of them were less than 2 years of old confirming other studies. Etiology was unknown in 36 patients (64.3%). In patients with Haemophilus influenza there was no diagnosed Meningitis.

Appropriate treatment is combination of drainage and antibiotic therapy on the basis of gram staining, age and risk factors, even inter-articular injection is suggested in some studies, but it is suggested mostly not to use it due to chemical synovitis (9).

In our study used antibiotics were cefazolin + Gentamycin in 44 cases (78.5%) and Ceftriaxone + cloxaciline in 12 cases (21.5%). Most of the joints can be aspirated by daily needle aspiration, but surgical drainage (open or arthroscopic) is suggested mostly, especially in Hip and in children.

In a study by Paulo et al on the children under 1 year of age, suitable results were reported by daily needle aspiration and antibiotic therapy (11). In our study Arthrotomy and antibiotic therapy were done in all patients.

In treatment of septic arthritis, to prevent pathological fractures and dislocations, the joint should be immobile for sufficient time. In some studies it is reported that, prolonged immobilization results in stiffness, pain, muscular atrophy, osteoporosis and degenerative changes (11). Paterson suggests 6 weeks immobilization for these patients (8). In our study, we used Spica casting in semi-abduction position of the joint after surgery in patients with hip septic arthritis and opened a window on cast to prevent the wound from infection. In patients with knee septic arthritis long splint was used for all patients and activity of the joint started after 48 hours.

Conclusion:

Infection in large joint is common in first 10 years of age especially in first 5 years. It is more common in males. Although joint infections are quite common; the diagnosis of septic arthritis is not always straight forward. A high index of suspicion must be maintained in order to make an accurate and prompt diagnosis of bone sepsis because, even, it is caused by bacteria; B/C is mostly negative. So it should always be considered as differential diagnosis. Complication is mostly seen in patients with late diagnosis and without efficient antibiotic therapy and on time surgery.

The most important goal in treating of septic arthritis is to confirm diagnosis and if possible identify the specific pathogen involved. Prompt evaluation of purulent joint fluid and prompt arthrotomy appear to be crucial both for preservation of articular cartilage and for resolution of the infection. On time diagnosis and earlier efficient treatment cause successful results without complication. Problems are mostly seen in patients with delayed diagnosis and delayed surgery and antibiotic therapy.

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Conflict of interest statement:

The authors have no financial interests to disclose in relation to the content of this article.

Reference:

1- Behrman J: Nelsons textbook of pediatrics. 17th ed. Sounders. Pennsylvania: 2003; PP: 562-78.
2- Goldenberg Don. Septic arthritis. The lancet; 1988; 351 (9097), PP: 197-204.
3- Herring J. A Tachdjions pediatric orthopedics, 3rd ed. Sounders. Pennsylvania: 2002; PP: 1841-59.
4- Scott J. Differentiation between septic arthritis and transient synovitis of the hip in children with clinical prediction algorithms. JBJS; 2004; 86(5): 956-61.
5- Ho G. Septic arthritis update. Bulletin of the Rheumatic Diseases; 2002; 51(1): 1-3.
6- Swan A, Amer H. The valve of synovial fluid assays in the diagnosis of Joint diseases. A literature survey. Annals of the Rheumatic Diseases; 2002; 61(6), 493-6.
7- Canale ST, Daugherty K. Campbells operative orthopedics; 10nd ed. Mosby, Philadelphia, 2003; PP: 685-729.
8- Nade S. Joint infections, if recognized early, treated with antibiotics septic arthritis need cripple. Medical Devices & Surgical Technology Week; 2003; 17 (2), 109.
9- Dubost J, Soubrier M. No changed in the distribution of organism responsible for septic arthritis over a year period. Annals of the Rheumatic Diseases; 2002; 61(3), 267-7 1.
10- Sandosky R. Oral antibiotic therapy for septic arthritis in children. American Family Physician; 2000; 61(9), 34-8.
11- Morrissy R, Weinsteiu SL: Lovell and winters pediatric orthopedics, 5th ed. Lipponcott. Philadelphia; 2001; PP: 466-71.

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