J Surg Med. 2020;4(11):1063-1067.
DOI: 10.28982/josam.806401

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN=2602-2079

Presentation and management of pediatric elbow septic arthritis: Case series

Pediatrik dirsek septik artritinin sunumu ve tedavisi: Olgu serisi

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Ethics Committee Approval: This study was approved by Istanbul Health Sciences University, Kanuni Sultan Süleyman Training and Research Hospital ethics committee; decision no: 2020.08.190; date: 9/3/2020). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.
Etik Kurul Onayı: Bu çalışma İstanbul Sağlık Bilimleri Üniversitesi, Kanuni Sultan Süleyman Eğitim ve Araştırma Hastanesi etik kurulu (karar no: 2020.08.190; tarih: 03.09.2020) tarafından onaylanmıştır. İnsan katılımcıların katıldığı çalışmalardaki tüm prosedürler, 1964 Helsinki Deklarasyonu ve daha sonra yapılan değişiklikler uyarınca gerçekleştirilmiştir.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 11/29/2020
Yayın Tarihi: 29.11.2020

Abstract

Aim: Septic arthritis is an emergency orthopedic situation, and septic arthritis of the elbow is rarely seen. The aim of this study was to evaluate the clinical and radiological determinants of septic arthritis of the elbow and review the mid-term clinical results.

Methods: A case-series study was conducted on patients who visited a tertiary pediatric hospital between January 2015-January 2017, were diagnosed with septic arthritis of the elbow, and treated with drainage and debridement. All evaluations included obtaining a thorough history, physical examination, and radiological and laboratory workup. In the laboratory tests, full blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and blood culture were examined. Mayo scores of the elbows were evaluated in the last follow-up visit.

Results: Five patients (5 elbows) including 3 males and 2 females with a mean age of 79 months (2-161 months) were included in this case-series. All patients presented with pain, signs of local inflammation (swelling, redness, increased heat) and fever (>38.5°). All patients had leukocytosis (leukocyte count>11,000), along with elevated CRP and ESR levels. Their mean CRP value during hospitalization was 110.2 (range: 17.5-285) and the mean ESR level was 46 (range: 24-85). The patients were followed up for a mean of 47 months (range: 31-58 months). At the final follow-up examination, the mean Mayo Elbow Performance Score of all the patients was 82.3 (range: 79-85), which was considered a good outcome.

Conclusion: Septic arthritis should always be kept in mind in patients presenting to the Emergency Department with severe elbow function restriction together with fever, redness, swelling and no significant trauma history. To obtain successful clinical results, early debridement, irrigation, antibiotics use are important.

Keywords: Septic arthritis, Elbow, Septic joint, Pediatric orthopedics

Öz

Amaç: Septik artrit acil bir ortopedik durumdur. Dirseğin septik artriti diğer eklemlere göre daha nadir görülmektedir. Bu çalışmanın amacı, dirsek septik artritinin klinik ve radyolojik belirleyicilerini değerlendirmek ve orta dönem klinik sonuçlarını gözden geçirmektir.

Yöntemler: Ocak 2015-Ocak 2017 tarihleri arasında üçüncü basamak bir çocuk hastanesine başvuran ve septik artrit tanısı alan ve ardından drenaj ve debridman ile tedavi edilen hastalardan vaka serisi çalışması yapıldı. Tüm değerlendirmeler; hasta geçmişi, fiziksel muayene ve radyolojik ve laboratuvar incelemelerini içeriyordu. Laboratuvar testlerinde tam kan sayımı, eritrosit sedimantasyon hızı (ESR), C-reaktif protein (CRP) ve kan kültürü incelendi. Ayrıca hastaların son takiplerinde dirsek Mayo skorları da incelendi.

Bulgular: Değerlendirme; yaş ortalaması 79 ay (2-161 ay) olan 3 erkek ve 2 kadın olmak üzere 5 hasta (5 dirsek) üzerinde yapıldı. Tüm hastalar ağrı, lokal inflamasyon belirtileri (şişlik, kızarıklık, ateş artışı) ve ateş (>38.5 °) ile başvurdu. Laboratuvar tetkiklerinde lökosit sayısı >11.000 olarak tanımlanan tüm hastalarda lökositoz tespit edildi ve tüm hastaların CRP ve ESR değerleri yüksekti. Hastanede yatış sırasında ortalama CRP düzeyi 110,2 (17,5-285) ve ortalama ESR düzeyi 46 (24-85) idi. Hastalar ortalama 47 ay (31-58 ay) takip edildi. Son takip muayenesinde, tüm hastaların Mayo Dirsek Performans Skoru ortalama 82.3 (79-85) idi ve iyi bir sonuç olarak değerlendirildi.

Sonuç: Acil servise şiddetli dirsek fonksiyon kısıtlaması ile başvuran ateş, kızarıklık ve şişlik ile başvuran ve önemli travma öyküsü olmayan hastalarda septik artrit her zaman akılda tutulmalıdır. Başarılı klinik sonuçlar elde etmek için erken debridman, irigasyon ve antibiyotik kullanımı önemlidir.

Anahtar kelimeler: Septik artrit, Dirsek, Septik eklem, Pediatrik ortopedi

How to cite/Atıf için: Kılıç B, Agar A. Presentation and management of pediatric elbow septic arthritis: Case series. J Surg Med. 2020;4(11):1063-1067.

Introduction

Septic arthritis is an emergency orthopedic condition. Diagnosis is an especially fundamental problem in children who cannot communicate their symptoms [1]. In developed countries, the incidence of pediatric acute bacterial septic arthritis is estimated to be 4-10/100 [2]. Intra-articular infection may result from hematogenous spread, contracting a local infection or inoculation directly into the joint. These infections can potentially lead to complications such as arthritis, osteomyelitis, misalignment, and limb length discrepancy. Previous studies have shown that up to 29% of pediatric patients who underwent had septic arthritis or osteomyelitis could be left with sequelae such as osteonecrosis, limb length discrepancy, and pathological fractures, all of which could lead to lifelong disability and functional limitations [3-5].

Septic arthritis may affect any joint in childhood, but the hips and knees are the most frequently involved, constituting 70% of pediatric septic arthritis cases [6]. When a painful knee or hip joint is encountered, septic arthritis should always be kept in mind in the initial diagnosis. Although septic arthritis of the elbow is rarely seen, there are a few publications in literature, mostly case reports. As it is seen so infrequently, diagnosis is more difficult, and if this diagnosis is not considered, incorrect treatment may be administered, causing permanent sequelae in the joint and surrounding bones.

There is no single test for the diagnosis of septic arthritis, so a clinical estimation algorithm based on a combination of factors makes diagnosis easier. One of these algorithms includes four important diagnostic variables related to septic arthritis of the hip, as defined by Kocher et al [7]. The presence of each one of these independent multivariable predictors has a cumulative effect, and when all four variables are identified, there is a 99.6% likelihood of septic arthritis in the hip of the child. As it is not possible to apply such a clinical estimation algorithm for septic arthritis of the elbow, the diagnosis and treatment of septic arthritis of the elbow is difficult.

The aim of this study was to evaluate the clinical and radiological determinants of septic arthritis of the elbow and review mid-term clinical results.

Materials and methods

A retrospective study was conducted in patients who presented at a tertiary level pediatric hospital between January 2015 and January 2017, were diagnosed with septic arthritis of the elbow, and treated with drainage and debridement. Approval for the study was granted by the Local Ethics Committee (Istanbul Health Sciences University, Kanuni Sultan Süleyman Training and Research Hospital ethics committee; decision no: 2020.08.190; date: 9/3/2020). Throughout the defined study period, a total of 5 patients who underwent elbow arthrotomy, irrigation and debridement, were identified.

All evaluations included a full history, physical examination, and radiological and laboratory examinations. In the laboratory tests, full blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and blood culture were examined. To discount fracture or other bone lesions, plain radiographs were taken of the elbow. If septic arthritis was suspected, arthrosynthesis was applied under ultrasonography (USG) guidance. Then, intra-articular collection and spread were evaluated more clearly in all the patients by obtaining magnetic resonance images (MRI) under emergency conditions to reveal the presence of osteomyelitis, which was not determined in any of the patients.

The synovial fluid analysis included white blood cell count and distribution, gram staining and culture assays. Patients determined to have septic arthritis of the elbow underwent emergency surgical drainage and received empirical intravenous antibiotics.

The data obtained from the medical records included age, gender, affected side, history of trauma to the elbow, history of chronic disease, clinical findings (body temperature, sensitivity, effusion), laboratory test results, and arthrosynthesis results. Fever was defined as an oral temperature of ≥38.5°. A definitive diagnosis of septic arthritis was made when there was bacterial reproduction in synovial fluid culture and white blood cell count in synovial fluid was ≥50,000 cells/m^3. In all the patients, the interventions were performed under general anesthesia. Entry was made with a lateral incision to the elbow joint, arthrotomy was performed, then the joint was debrided and irrigated. A drain was used in all the patients for fluid drainage. All the drains were removed on postoperative day 1. An above-the-elbow plaster cast was applied and used for 10 days postoperatively. On the 10^{th} day, the cast and the sutures were removed, and passive and active elbow range of movement exercises were started. Until the culture results were received, along with consultation with a pediatric infectious diseases specialist, cefotaxime and cloxacillin were started as empirical antibiotics in the postoperative period. When the culture results were received, the antibiotic treatment was switched to drugs specific to the agent. The patients were followed up postoperatively in the orthopedic ward, where intravenous antibiotic therapy and laboratory parameters were evaluated at 3-day intervals. When patients' clinical statuses improved and a response to treatment was observed in laboratory parameters, they were discharged with oral antibiotic treatment. Antibiotics were administered to all patients intravenously for 3 weeks (during hospitalization) and per oral route for 3 weeks. Laboratory and clinical follow-up were performed at 1-week intervals for 6 weeks.

Results

A total of five patients (5 elbows) including 3 males and 2 females with a mean age of 79 months (2-161 months) were evaluated. The right elbow was involved in 3 patients and the left elbow, in 2 patients. Case examples are presented in Figures 1a-1c and 2a-2c.

On presentation, none of the patients had a history of trauma or any known chronic diseases. All patients presented with pain, signs of local inflammation (swelling, redness, increased heat) and fever (>38.5°). In the laboratory tests, leukocytosis was determined in all the patients (WBC>11,000), and CRP and ESR values of all patients were elevated. The mean CRP level during hospitalization was 110.2 (range, 17.5-285) and the mean ESR level was 46 (range, 24-85) (Table 1).

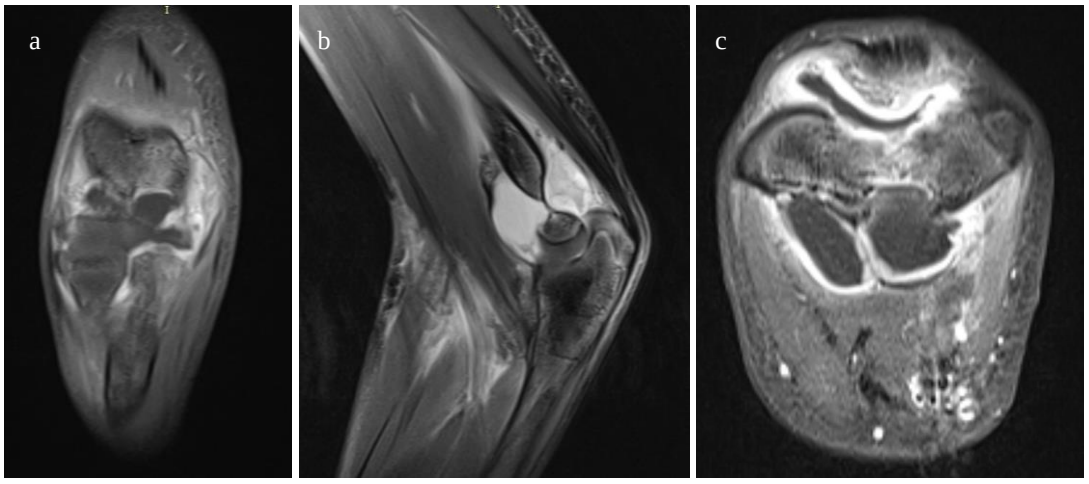

Figure 1: Preoperative MR image of the right elbow of a 13-year-old male patient (Patient 4) (a: coronal MR image, b: Sagittal MR image, c: axial MR image)

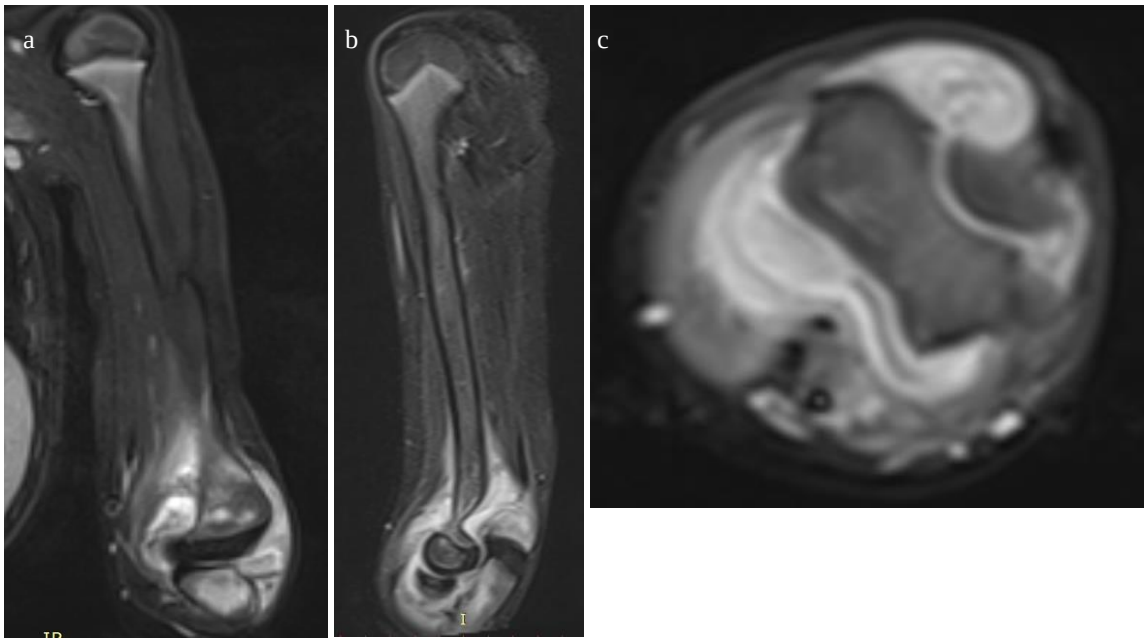

Figure 2: Preoperative MR image of the left elbow of a 7-year-old male patient (patient 5) (a: coronal MR image, b: sagittal MR image, c: axial MR image)

The mean time from onset of patient complaints to surgery was 1.4 days (range, 0-2 days) (Table 1). The culture results showed production of MSSA in 4 patients, and streptococcus pyogenes in 1 patient. The mean length of stay in hospital was 22.4 days (range, 21-24 days), and the mean duration of antibiotic treatment was 42 days (Table 1). Empirical antibiotic treatment was administered to all the patients until the intraoperative culture results were obtained, which was followed by antibiotics specific to the bacteria identified in the cultures. The antibiotics were administered based on consultations with a pediatric infectious diseases specialist. Oxacillin and gentamicin were administered to 4 (75%) patients and oxacillin and ceftriaxone, to one (25%).

The patients were followed up for a mean of 47 months (range, 31-58 months). At the final follow-up examination, the mean Mayo Elbow Performance Score [8] of all patients was 82.3 (range, 79-85), which was considered a good outcome (Table 1). No continuation of pathology was determined in the clinical and laboratory results at the final follow-up examinations. No complications were seen in any of the patients.

Table 1: Laboratory and clinical findings of patients

	ESR (mm/saat)	CRP (mg/L)	WBC ($10^3/\mu L$)	Mayo	Length of hospitalization (day)	Duration of antibiotic use (day)	Time from application to operation (days)
Patient 1	24	17.46	25.93	79	20	40	0
Patient 2	42	141.21	15.27	EX	15	23	4
Patient 3	85	285	16.97	83	21	42	0
Patient 4	48	71.32	14.32	82	22	44	3
Patient 5	31	35.98	13.86	85	24	41	0

Discussion

The main findings of this study were that septic arthritis of the elbow is uncommon, but pediatric orthopedic surgeons should use laboratory and radiological evaluations when there is clinical suspicion and should make every effort to perform debridement and irrigation to the joint as soon as possible to avoid destructive complications.

It has been reported in literature that an elbow, misdiagnosed as nursemaid's elbow or that which cannot be fully treated may be septic arthritis [9]. This is the most common diagnostic error for this disease. The differential diagnosis should be made clinically or from the presence of effusion shown on ultrasonography. Effusion is not seen in nursemaid's elbow. In 1% of nursemaid's elbow cases, there may be underlying osteomyelitis or septic arthritis [9]. To determine whether the patient is immunosuppressive and learn if there is a history of

infection which may have caused hematogenous spread, anamnesis is extremely important.

In the early stage of the disease, radiological changes may be observed on direct radiographs, and it is important to know that at a mean of 2-3 weeks after disease onset, periosteal reaction and radiological changes occur in the subacute period. Therefore, ultrasound is extremely useful to strengthen the diagnosis in the acute period. In some cases, it is difficult to determine minimal collection in the elbow with examination. In these cases, ultrasound shows intra-articular collection and inflammation, and in non-acute cases it allows the possibility of evaluation of the periosteum. However, computed tomography (CT), and magnetic resonance imaging (MRI) are more useful than direct radiographs in the determination of soft tissue and bone tissue infection, although there are problems such as the amount of radiation exposure in CT and the expense of MRI, and the need for anesthesia because of the age of the patient. In our practice, direct radiographs are obtained routinely for every patient seen in the Emergency Department, and in cases with suspected septic arthritis, following intra-articular effusion determined on USG first, MRI was obtained under emergency conditions to reveal any pathology in adjacent bones.

ESR and CRP showed changes in all the cases in this series. These data were consistent with the data reported in previous studies [10,11]. The CRP value is reported as a specific parameter for septic arthritis of the elbow, but WBC may be normal in some patients [12]. CRP value is also an important parameter for disease follow-up. In the current study, attention was paid to the CRP value during follow-up and at the end of treatment.

In the current study, the etiological agent was identified in the synovial fluid culture of all (100%) 5 patients, and other studies have similarly reported that the bacteria responsible could be identified in 82%-95% of cases [13,14]. In the literature, gram positive cocci were reported as the micro-organism responsible in up to 92% of cases of pediatric septic arthritis [15]. When the cultures of the patients were examined in the current study, a reproduction of MSSA was observed in 4 patients and Strep. Pyogenes, in one patient. Despite the reproduction in culture in all study patients, it has been stated in literature that culture results may be negative in up to 20% of septic arthritis cases [16]. That culture production was determined in all the cases in this series is thought to be due to the patients not having received antibiotics before the diagnosis, therefore, there was no antibiotic suppression, and all the arthrosyntheses were performed under USG guidance. In cases where no micro-organism is produced in the culture, diagnosis of septic arthritis can be made using the criteria described by Newman [17]. At least one of the following criteria must be met: Positive synovial fluid culture, negative synovial fluid culture with positive blood culture, negative culture associated with previous antibiotic use, purulent synovial fluid in the shoulder or elbow joint drainage.

Osteomyelitis is seen frequently in children with septic arthritis, with reported rates of 17%-33% [18,19]. Especially in patients where diagnosis is missed and intervention is late, the likelihood of osteomyelitis development is higher [20]. In the 5 patients treated in this study, osteomyelitis was not determined in any patient, which was thought to be associated with the early interventions performed.

Although the subject of how long antibiotherapy should be continued in septic arthritis patients remains a matter of debate, there are studies recommending continuation for 6 weeks and others recommending that treatment is terminated with the follow-up of laboratory parameters [21]. In the current study, antibiotherapy was continued throughout hospitalization of the patients, who were then discharged with oral antibiotics when the clinical and laboratory findings improved.

Early diagnosis and treatment can prevent the destructive results that can occur in septic arthritis, such as elbow instability, joint stiffness, and extremity shortness [7,22,23]. No complication development in any of the patients in this series can be attributed to the early diagnosis and treatment. At the final follow-up examination, the mean Mayo score was 82.3, and functional results were worse in comparison with the data in the literature [7]. This may be since in previous studies that have reported functional results, only arthrosynthesis followed by antibiotic therapy was administered, whereas in the current study, open surgical intervention of the joint was performed with debridement.

Limitations of the current study include the sparse number of cases, the absence of a control group in which different treatment methods were used, and long-term follow-up.

Conclusion

Septic arthritis should always be kept in mind in patients presenting at the Emergency Department with severe elbow function restriction together with fever, redness and swelling and no significant trauma history. However, no findings may be observed on direct radiographs in the early stage, therefore, when there is clinical suspicion, puncture must be applied under USG guidance. MRI is extremely useful in the determination of adjacent bone pathologies. To obtain successful clinical results, early debridement, irrigation, and the use of antibiotics are important.

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