Original Research Article

Relevance of the clinical and laboratory profile in decision-making for patients with septic arthritis

Abstract

Background

10%–30% of patients with adult-onset septic arthritis septic arthritis had sterile synovial fluid (SF), and it was difficult to diagnose these individuals, making care difficult. The goal of this study was to analyse the variations between persons with proven and suspected septic arthritis.

Method

A cross-sectional descriptive study was conducted in a tertiary referral facility at King Saud Medical City, Riyadh, Saudi Arabia, from January 2022 to February 2023. After receiving clearance from the institutional ethics board, a practical sample approach was employed. The patients were recruited in the experiment after providing written informed consent. Patients over the age of 18 who had been scheduled for an arthrotomy and joint lavage by the treating surgeon and had clinical symptoms that suggested SA were included in the study. Based on the results of the analysis of the SF and tissue taken during the arthrotomy, the patients were divided into two groups: group 1 (Newman A/confirmed), and group 2 (Newman B and C/suspected).

Results

40 patients was involved, with 21 patients placed in group 1 and 17 in group 2. The median age of the study population was 49 (36-59), and men dominated both categories (85% and 73%, respectively). Pain was the most common immediate symptom (100%) and was followed by edoema around the injured joint. Except for hip and shoulder swelling, only 25 out of the 28 people who experienced swelling. At the time of admission, a fever was found in 23.8% of patients. Seven patients were on immune-modulative drugs at the time of presentation for a number of ailments, including polymyositis, immune thrombocytopenic purpura, and post-renal transplant.

Conclusion

In order to avoid life-threatening consequences, septic arthritis is an orthopedic emergency that requires immediate and urgent treatment. Similar demographics, clinical characteristics, and laboratory data are present in both confirmed and suspected cases of septic arthritis at presentation, which might lead the treating surgeon. In the case that bacteria cannot be cultured, treatment should be based on solid clinical judgment.

Introduction

“A early diagnosis and treatment are required for septic arthritis (SA), an orthopedic emergency that can result in lifelong impairment and irreparable damage to the articular cartilage. In addition to the high morbidity, SA's mortality is thought to be around 11%”.(1)

“The patients with SA who were older than 30 were retrospectively examined and divided into three groups based on the discovery of microorganisms in the synovial fluid (SF): Newman Microorganism isolation from the SF of the affected joint, Newman B indicates the isolation of a microorganism from another source, and Newman C indicates the lack of an isolated microorganism but the presence of histological and radiographic signs of infection or turbid fluid aspirated from the joint”.(2)

“According to reports, 10% to 30% of patients with adult-onset SA have sterile SF, making it difficult to care these individuals due to the lack of a definitive diagnosis”.(1,3) “the lack of published prospective research that have examined this patient group and its features, particularly in the community, goes hand in hand with the diagnostic conundrum”. [11]

“The goal of this study was to examine the differences in patient demographics, clinical characteristics, and laboratory data between adult with proven (Newman A) and suspected (Newman B & C) SA”. [11] We also wanted to assess the risk variables for adult-onset SA among the participants in our research.

Method

From January 2022 to February 2023, a cross-sectional descriptive research was carried out at a tertiary referral centre in King Saud Medical City, Riyadh, Saudi Arabia. A convenient technique of sampling was used after institutional ethics board approval. After receiving written informed permission, the patients were enrolled in the trial. The research comprised patients over the age of 18 who had clinical symptoms that suggested SA and had been scheduled for an arthrotomy and joint lavage by the treating surgeon.

Patients with open joint injuries and prosthetic joint infections (PJI) were excluded. A thorough history, a demographic profile, and a clinical examination were all part of the first evaluation of individuals. The patient's history was used to collect information on the patient's symptoms' length (measured in days), co-occurring diseases, previous antibiotic doses, and immunosuppressive medications usage.

In order to determine the baseline white blood cell count, erythrocyte sedimentation rate, C-reactive protein (CRP), and blood culture before surgery, blood samples were taken. The SF and tissue sample from the arthrotomy were collected in a sterile container and sent within two hours to the microbiology and biochemistry labs for normal procedure analysis.

The patients were split into two groups based on the analytical report of the SF and tissue collected during arthrotomy: group 1 - (Newman A/confirmed), Group 2: (Newman B and C/suspected).

A synovial histology suggestive of acute suppurative infection, an SF white blood cell count > 50,000 with predominant neutrophils suggesting septic joint, joint aspiration revealing frank pus, or a positive blood or exudate culture from a nearby wound were used to identify cases with sterile SF cultures for the study.

SPSS 24 was used to assess the information gathered from groups. The continuous variables were expressed as mean (SD) or median (IQR), depending on the distribution's normality, while the categorical variables were reported as proportions. For categorical variables, the unpaired t-test or Mann-Whitney test was used to examine differences between the two groups; for continuous variables, the Mann-Whitney test or Chi-square test was employed, depending on normality.

Results

42 patients had arthrotomies, but only 40 had a final evaluation, with 21 patients being placed in group 1 and 17 in group 2. The summary of Table 1 shows that the two groups had comparable demographic characteristics. The median (interquartile range) age of the study participants was 49 (36-59), and men dominated both categories (85% and 73%, respectively). Most patients, mostly on the right side, developed septic arthritis of one knee joint. There was just one incident of both knee infection in group II. There were symptoms of sepsis and hyperglycemia in this patient, but neither systemic nor inflammatory arthritis was seen. a further sufferer with polyarticular disease.

Tables 2 and 3 provide a summary of the data on the clinical and laboratory characteristics of the two groups. There were, on average, six (4-8) days till the presentation. 100% of the time, pain was the only initial sign. Edoema surrounding the damaged joint was the next most frequent symptom. Only 25 out of the 28 persons who suffered edoema really had considerable swelling, with the exception of hip and shoulder swelling. 23.8% of patients had a fever at the time of admission.

Nine patients—four from group 1 and five from group 2—presented with discharge wounds around joints throughout our examination. Following the use of a ring fixator, three patients developed pin tract infections; three others experienced cellulitis of the lower limb with bleeding; one experienced serous discharge from the location of the tibial tunnel screw following the reconstruction of the anterior cruciate ligament; another experienced necrotizing fasciitis of the leg; and one experienced a deltoid abscess following an intramuscular injection.

In our study, 7 patients (2 from group I and 5 from group II) received antibiotic medication prior to synovial fluids culture or joint lavage. One patient with septic arthritis of the shoulder who had previously received intravenous antibiotics for osteomyelitis of the proximal humerus, three patients who had sepsis at presentation and started antibiotic regimen, one patient with necrotizing fasciitis, and one patient with a history of recurrent pyogenic infection.

Four of the research subjects were diagnosed with systemic sepsis at the presentation. First patient was undergoing corticosteroid-based therapy, second patient had liver disease, and third patient had CKD and was diabetic.

Seven patients were on immunosuppressive medications at the time of presentation for a number of ailments, including immune thrombocytopenic purpura, polymyositis, and renal transplant. Only two patients received Methylprednisolone monotherapy, the other 4 patients getting Prednisolone in combination with Tacrolimus or Azathioprine. The SF cultures of four of these people were positive, one of them having MRSA grow, and the others had gram-negative bacteria grow.

Table 1 : Demographic variables

Variables	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Age, median (interquartile range) (year)	41 (26.4–55.4)	53.6 (38.2–64)	0.160
Sex			
Male	18 (85.1)	14 (73.6)	0.285
Female	3 (14.9)	5 (26.3)	
Joint involved, *n* (%)			
Knee	14 (66.6)	16 (84.2)	
Hip	1 (4.7)	0 (0)	
Shoulder	4 (19.04)	3 (15.7)	0.994
Elbow	1 (4.7)	1 (5.2)	
Wrist	1 (4.7)	0 (0)	
Ankle	1 (4.7)	0 (0)	
Side, *n* (%)			
Right	16 (76.1)	11 (57.8)	0.411
Left	4 (19)	7 (36.8)	

Variables	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Involvement of more than one joint	1 (4.7)	1 (5.2)	
Duration of stay in hospital, median in days	16 (10.4–23.0)	16.4 (13.2–22.6)	0.879

Table 2: Clinical features comparison between the two groups.

Clinical features	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Symptoms duration, median (interquartile range) (day)	6 (4–12)	7.5 (4–8.8)	0.6
Pain	21	19	
Swelling			
Yes	13 (61.9)	17 (89.5)	0.236
No	8 (38.1)	2 (10.5)	
Significant swelling	10 (47.6)	15 (78.9)	0.162
Fever			
Yes	5 (23.8)	5 (26.3)	0.867
No	16 (76.2)	14 (73.7)	
Discharge			
Yes	4 (19)	5 (26.3)	0.854
No	17 (81)	14 (73.7)	

Table 3 : Biochemical parameters comparison between groups.

Parameters	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Blood parameters			
ESR, median (interquartile range) (mm/h)	53 (42–99)	71 (62–94)	0.31
CRP			
Positive	12 (57.1)	8 (42.1)	0.89
Negative	9 (42.9)	11 (57.9)	
Blood TLC, median (interquartile range) (cells/mm^3)	10,190 (7110–13430)	10,512 (7350–15209)	0.45
Elevated TLC			
Yes	9 (42.9)	9 (47.4)	0.66
No	12 (57.1)	10 (52.6)	
Blood culture			
Positive	6 (28.6)	5 (26.3)	0.77
Negative	15 (71.4)	14 (73.7)	
Synovial fluid parameters			

Parameters	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Gram stain			
Positive	4 (19)	3 (15.8)	0.82
Negative	17 (81)	16 (84.2)	
Synovial fluid color (purulent)	17 (81)	7 (36.8)	0.02
Synovial TLC, median (interquartile range) cells/mm³	42,225 (3215–71450)	19,465 (1154–36216)	0.54
Synovial protein, median (interquartile range) (g/mL)	0.02 (0.01-0.03)	0.06 (0.02-0.04)	0.61
Synovial sugar, median (interquartile range) (mg/mL)	0.07 (0.05-0.10)	0.06 (0.03-0.10)	0.45
Synovial LDH, median (interquartile range) (IU/L) (*n* = 12)	5633 (5100–5995)	2622 (912–4504)	0.31
USG echoes			0.58
Positive	14 (66.7)	15 (78.9)	

Table 4 : Risk factors in group 1 and group 2.

Risk factors	**Group 1 (*n* = 21)**	**Group 2 (*n* = 19)**	***p*-value**
Systemic diseases			
kidney disease	6 (28.6)	3 (15.8)	0.490
Diabetes	9 (42.9)	2 (10.5)	0.160
liver disease	3 (14.3)	2 (10.5)	0.455
Others	7 (33.3)	11 (57.9)	0.243
Local factors			
joint disease	2 (14.3)	3 (15.8)	0.845
Peri-articular infection	0 (0)	3 (15.8)	0.216
Recent steroid intra-articularly	0 (0)	0 (0)	
History of septic arthritis	1 (4.7)	0 (0)	0.311
Joint surgery	4 (19)	1 (5.2)	0.502
Cellulitis	1 (4.7)	1 (5.2)	
ulcer of the leg	0 (0)	1 (5.2)	
Use of Intravenous drug	0 (0)	0 (0)	
infection of urinary tract	1 (4.7)	0 (0)	

Discussion

SA continues to cause a large amount of morbidity and mortality despite all attempts at diagnosis and therapy.(4) The objectives of management in SA are timely institution of therapy and a satisfactory functional result, but to get there, one must first solve the diagnostic enigma that comes with it. Inflammatory arthritis and SA may present with different clinical characteristics, SF analyses, and culture reports, delaying diagnosis.

Due to lack of rationale and the ensuing necessity for longer treatment duration and hospital stays, this uncertainty frequently prevents the surgeon from instituting early aggressive therapy. Our study sought to examine the variations in patient demographics, clinical characteristics, and laboratory data across adult population groups with confirmed (Newman A) and suspected (Newman B and C) SA. Demographics, clinical presentation, and metabolic profile of the two groups did not differ at all.

These results mirrored those of research on Caucasians that were previously published but whose authors were unable to provide solid evidence of differences between suspected and confirmed cases of SA in adults.According to a research, age beyond 80 is a standalone risk factor for SA in adults.(5) While the other risk variables were identical, some researchers, in contrast to our study, observed that the mean age of beginning of SA in adults was greater.

Margaretten et al.(6) assessed the accuracy and diagnostic precision of clinical history and examination in a meta-analysis of 14 trials. Chills and rigours had a limited diagnostic yield, whereas the investigators concluded that pain (86%), edoema (79%) and fever (58%) were sensitive for the diagnosis of SA in adults. All of our patients experienced persistent discomfort, and a sizable portion (75%) had edoema. More over 20% of the patients in each group arrived at the hospital with a fever. It has been shown that fever and acute phase reactants are unreliable markers of SA in adults.(4,6)

Furthermore, numerous research have found that there is controversy regarding the cut-off temperature to determine fever.(6) 8 confirmed patients in our investigation were negative for CRP, despite Gupta et al.(1,4) reporting that CRP was a superior predictor for the diagnosis of SA. Because the foci of infection in the area were thought to have caused the joint infection, a subset of 7 patients who arrived with a discharging lesion close to the joint were all anticipated to be confirmed cases. 5 of these, however, belonged to group 2, and only 4 to group 1.

Primary joint illness, a prosthetic joint, and pharmacologic immunosuppression are said to be the main risk factors for SA, according to several research.(4,5,7) in this investigation, we found that CKD, DM, and pharmacologic immunosuppression were frequently present together and were the main causes of SA. One of the risk variables for SA in our research group was a recent surgery close to the joint, and the microorganism profile of these individuals was consistent with a hospital-acquired infection. It has been shown that the presence of prosthetic joints is associated with an increased incidence of SA, both SF culture-positive and sterile.(4,7)

In 50%–70% of adult SA patients, synovial total leucocyte counts have been reported to be > 50,000 cells/mm3 with a neutrophilic preponderance (> 75%), however immunocompromised

people often have lower levels.(8) According to studies, a minimum inoculum of 107 bacteria is necessary for the development of clinical signs and symptoms.(9) Weston et al.(10) showed that the sensitivity of gramme stain and SF culture was 50% and 67%, respectively. Early introduction of antibiotic therapy in these individuals may generate a picture of arthritis similar to Newman B and C.

The limited sample size and brief research period were the study's weaknesses. More information on the ultimate outcomes of Newman A and Newman B as well as regarding variations in functional outcome and mortality may have been obtained using a prospective research design.

Conclusion

According to Newman's criteria, verified and suspected SA patients in this study's adult sample share comparable demographics, clinical traits, and laboratory results upon presentation. A prospective research with a bigger sample size, however, could be able to shed additional light on the variations between the two groups. Although there are similarities in risk factors between the two categories, SA is still an orthopaedic emergency that demands quick action in order to avoid life-threatening consequences. The management should take into account a variety of variables rather than relying just on one. In the case that microorganisms cannot be cultured, sound clinical judgement should direct treatment.

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Consent

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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