

BRIEF REPORT**CHANGES IN NONGONOCOCCAL SEPTIC ARTHRITIS: DRUG ABUSE AND METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS***

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Septic arthritis continues to be a major medical problem for metropolitan hospitals. Previous studies have defined risk factors, joint distribution, and the most common organisms implicated in this condition (1-4). Recently, we became aware of a pattern of septic arthritis that differed significantly from that previously reported. Over a 2-year period, a retrospective analysis of septic arthritis revealed the emergence of a new pattern of antibiotic resistance among the bacteria populating a well-defined subgroup of patients.

Patients and methods. Wayne County General Hospital, a 270-bed general hospital in suburban Detroit, has continuously served indigent citizens of the inner city of Detroit and the population of the surrounding area since the turn of the century. A review of the hospital's records for the 2-year period, January 1, 1981 through December 31, 1982, showed 46 patients with a discharge diagnosis of septic arthritis, excluding all cases of *Neisseria gonorrhoea*. These patients' medical records, including their bacteriology laboratory data, were reviewed for inclusion in the study.

Criteria for inclusion were: presentation with an acutely painful, tender, or swollen joint and positive synovial fluid bacterial cultures. Of the 46 medical

records reviewed, 28 met our criteria. Of the 18 patients excluded, 6 had positive blood cultures but negative synovial fluid cultures, 10 had negative synovial fluid and blood cultures, and 2 had osteomyelitis on presentation. The records were reviewed with attention to bacteria isolated, joints involved, predisposing factors, and short-term outcome.

Results. During the period of the study, there were 21,442 hospital admissions. Twenty-eight patients met the study criteria, giving an incidence of 1.3 cases per 1,000 hospital admissions. Twenty-two of the 28 patients were male and 6 were female; 19 were black, 8 white, and 1 Hispanic. The age range was 1-56 years, with a mean age of 33.8. Three patients were children (ages 1, 4, and 13).

Table 1 lists the predisposing factors identified, and compares their incidence with those in the 1966-77 series published from this hospital (1). The main predisposing factor in both series was the illicit use of intravenous drugs, which was present in 21 (75%) of the patients in this study. Six of these 21 patients had concomitant extraarticular infections which included septic thrombophlebitis, groin abscess, cellulitis, or pulmonary infections. These infections were caused by the same bacteria as that cultured from the joint. Five had a history of nonpenetrating trauma to the involved joint. In 11 patients, intravenous drug abuse was the only predisposing cause. No patient had evidence of bacterial endocarditis as manifested by embolic phenomena, changing heart murmur, or abnormal cardiac ultrasound findings.

Seven patients had no history of intravenous drug abuse. Three of these patients did have prior arthritis of the involved septic joint, including rheumatoid arthritis, gout, and scleroderma with calcinosis.

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Submitted for publication February 27, 1984; accepted in revised form August 21, 1984.

Table 1. Predisposing factors in nongonococcal septic arthritis identified in this study (1981-82) and the previously reported (1966-77) series from the same hospital

	1981-82 (n = 28)	1966-77 (n = 54) (ref. 1)
Intravenous drug abuse (IVDA)	21	19
Extraarticular infection	6	
Local trauma	5	
IVDA alone	11	
Prior arthritis	3	4
Chronic illness	1	13
Immunosuppression	0	0
Preceding trauma	0	14
Other	0	16
None	3	0

None of the patients was immunocompromised by cytotoxic or high-dose steroid drug therapy or malignant disease, though the rheumatoid arthritis patient was receiving 5 mg per day of prednisone. One patient was a chronic alcoholic.

The most frequently involved joint was the knee, with involvement in 15 patients. Three patients each had involvement of the hip or ankle, 2 each the shoulder or elbow; 1 patient each had infection of a wrist, sternoclavicular, sacroiliac, or interphalangeal joint. One patient had both an elbow and a knee involved. The patients with sacroiliac and sternoclavicular joint infections both had histories of intravenous drug abuse.

Thirty-one bacterial isolates were recovered from the 28 patients (Table 2). *Staphylococcus aureus* was the most frequently cultured organism, occurring in 18 patients (64%), and in 7 patients the species isolated was resistant to methicillin. Beta-hemolytic

Table 2. Bacteria cultured from synovial fluid of patients in this study (1981-82) and from the 1966-77 study

	1981-82 (n = 28)	1966-77 (n = 54) (ref. 1)
<i>Staphylococcus aureus</i>	18	19
Methicillin-sensitive	11	19
Methicillin-resistant	7	0
<i>Staphylococcus epidermidis</i>	1	9
Beta-hemolytic streptococci	8	6
Non-beta streptococci	0	2
Gram-negative	3	12
<i>Pseudomonas</i>	0	6
<i>Escherichia coli</i>	1	1
Others	2	5
<i>Propionibacterium acnes</i>	1	0
Other bacteria	0	6

streptococci were recovered from 8 patients (29%). Gram-negative organisms included *Escherichia coli*, *Enterobacter cloacae*, and *Hemophilus influenzae*. *Propionibacterium acnes* was recovered from the synovial fluid of 1 patient.

Polymicrobial infections were observed in 2 patients. In 1 patient with rheumatoid arthritis, beta-hemolytic *Streptococcus*, *Staphylococcus epidermidis*, and *P. acnes* were all recovered from the wrist joint. In the other patient, both *E. coli* and *E. cloacae* were grown from right knee synovial fluid. This patient had had urate crystals seen in his joint fluid and for many years also had a metallic foreign body in the soft tissue around the knee.

Twenty-three of the 28 patients studied were treated medically with appropriate intravenous antibiotics and daily needle aspiration of the infected joint. Four of these patients subsequently underwent surgical drainage due to failure to adequately respond to the medical regimen, as manifested by continuing large effusion, high synovial fluid leukocytosis and low glucose, fever, and joint pain. The incriminating organism in 3 of these 4 patients was *S. aureus* (2 methicillin-resistant and 1 methicillin-sensitive); it was *E. coli* and *E. cloacae* combined in the other.

Five patients were treated primarily with surgical drainage in addition to antibiotics, either on admission or shortly thereafter. Three patients had hip involvement (2 were children, ages 4 and 13 years). The other 2 patients were directly admitted to the orthopedic surgical service; they had infections of the knee and ankle, respectively.

The mean duration of hospitalization for those treated medically and surgically was 23.6 days and 29.5 days, respectively, with medians of 28 days and 24 days. Osteomyelitis was diagnosed in 7 patients, 5 in the medically treated and 2 in the surgically treated groups. Criteria for the diagnosis were lucent bone lesions on radiograph, and/or abnormal results on a bone scan.

Two patients died. One was a 30-year-old man with overwhelming sepsis and adult respiratory distress syndrome. The other was a 40-year-old man with rhabdomyolysis, hypertensive crisis, and cardiac arrhythmia. All of the remaining patients were improved when discharged. Seven patients (all intravenous drug abusers) left against medical advice prior to completion of their recommended course of antibiotics. Only 6 patients returned for followup examinations. Five of the 6 were asymptomatic with full range of motion of the affected joint. The sixth patient had had a staphylo-

coccal infection of the glenohumeral joint that had required surgical drainage. That patient had severe limitation of motion of the shoulder.

Discussion. During the period 1966–77, the incidence of nongonococcal septic arthritis was 54 cases out of 156,203 hospital admissions, or 0.34 cases per 1,000 admissions (1). In comparison, in this study we found an incidence of 1.3 cases per 1,000 admissions, or a fourfold increase. The majority of patients were between the ages of 23 and 40 (mean age 33.8). We had only 3 pediatric patients in this series. This is in contrast to Rosenthal's series (2) in which 20 of 71 patients (28%) were under 16 years of age.

The most frequent predisposing cause of septic arthritis was intravenous drug abuse, which occurred in 75% of the patients, compared with an occurrence in 35% (19 of 54 patients) in the 1966–77 series from this hospital (1).

The occurrence of septic arthritis *not* associated with intravenous drug abuse was similar in the 2 studies. While the true prevalence of intravenous drug abuse in the community is unknown, during the period of the present study a marked increase in hospital admissions due to intravenous drug abuse-related disease was observed.

Other studies report a much lower percentage of patients who are intravenous drug abusers: Only 4 of 71 patients (5.6%) were abusers of intravenous drugs in Rosenthal's report (2), and Bayer (4) reported 8 of 21 patients (38%). Seven of Bayer's patients who were drug abusers had involvement of the sternoclavicular joint. That joint, and the sacroiliac, are reported to be frequently involved in drug addicts (4,5). We had 1 patient each (both intravenous drug abusers) with infection of the sternoclavicular and sacroiliac joint.

Staphylococcus aureus is the most common bacterium causing nongonococcal septic arthritis in the adult (1–3). This was true in the 1966–77 series and in our current series. In previously published papers, the *Staphylococcus* isolated was methicillin-sensitive *S aureus*. However, in our drug abuser population a new and not previously reported finding was the recovery of methicillin-resistant *S aureus* from synovial fluid. Thirty-nine percent (7 of 18) of staphylococci isolated were methicillin-resistant. No methicillin resistance was encountered in the 1966–77 series. The occurrence of methicillin-resistant *S aureus* has been previously reported, particularly in the Detroit area (6–8). In those reports the incidence of methicillin-resistant *S aureus* in community-acquired infections rose from 3% in March 1980 to 38% in September 1981 (6).

Gram-negative bacteria were found in 11% (3 of 28) of our patients, compared with 22% (12 of 54 patients) in the 1966–77 series. A higher incidence has been reported in other studies: Goldenberg and Cohen (3) reported 32% (19 of 59), and Rosenthal (2) listed 25% (16 of 63 patients). *Pseudomonas* has been isolated particularly from heroin addicts (4,5). Yet none of our patients had *Pseudomonas*, despite 75% admitting illicit intravenous use of drugs (primarily a mixture of heroin and various adulterants, especially quinine). This is of particular interest since Detroit has had the reputation of leading the nation in the incidence of *Pseudomonas endocarditis* (9).

In view of these bacteriologic findings, in areas where intravenous drug abuse is endemic or methicillin-resistant *S aureus* has been isolated, initial antibiotic therapy while awaiting culture results must include treatment for this bacterium. This may be accomplished with vancomycin, the drug of choice against methicillin-resistant *S aureus*. The aminoglycoside gentamicin, in isolates from our hospital as well as others in Michigan (7,8), also has anti-methicillin-resistant *S aureus* activity, and to achieve cost containment, an initial regimen of nafcillin and gentamicin is satisfactory. For proven methicillin-resistant *S aureus* infections, however, vancomycin is required, and any antibiotic regimen prior to definitive culture results must contain an aminoglycoside for activity against gram-negative bacteria.

The mean duration of hospitalization was not significantly different for patients treated medically versus those treated surgically. Two patients died of nonrelated serious diseases. The remainder were all improved at discharge. Only 6 patients were seen for followup examinations, underscoring the fact that the majority of these patients were not reliable followers of medical advice. It may be speculated, however, that most of them probably did not have recurrences or we would have seen them again at our hospital emergency department, though it is possible that they might have sought care at another hospital.

This study demonstrates 3 important diagnostic and therapeutic considerations for physicians managing patients with suspected septic arthritis. These considerations, which are particularly valid in metropolitan areas with a high prevalence of illicit drug use, are as follows: 1) Septic arthritis is increasing in incidence, as demonstrated by a fourfold increase in admission due to this problem in the 1980s at Wayne County General Hospital. 2) Intravenous drug abuse is now the chief predisposing factor for septic arthritis in our series. 3) Methicillin-resistant *Staphylococcus*

aureus has emerged as a frequent and important pathogen for septic arthritis and must be considered in initiating antibiotic therapy.

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