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Bacterial Arthritis in a District Hospital

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Summary **Between 1977 and 1988 in the Enschede hospital 72 patients were seen with bacterial arthritis of one or more joints. Staphylococcus aureus was most frequently the causative agent (52%) and the knee was the most frequently infected joint (42%); the mortality rate was 11%. Complete restoration of pre-existent function was seen in 52% of the affected joints. In patients with severe deterioration of joint function after the bacterial infection, the period between the first symptoms and start of treatment (mean 30 days) was significantly longer than in patients with no or moderately deteriorated joint function (mean 10 days). The primary focus was mostly a skin infection, predominantly localized on the lower extremities. Half of all cases of bacterial arthritis occurred in patients with rheumatoid arthritis (RA). We therefore conclude that patients with RA and skin infections, especially if localized on legs or feet, should be treated without delay and that one should not hesitate to prescribe antibiotics. Erythrocyte sedimentation rate (ESR) was less than 20 mm after one hour in 13% and blood leucocyte count less than 10×10^9/liter in 55% of all patients, showing that a normal ESR and/or blood leucocyte count do not exclude bacterial arthritis. In 4 out of 9 patients with infected prosthetic joints the infection resulted in loosening of the joint, before antibiotic treatment was started. In the other 5 patients bacterial arthritis recurred, in one patient resulting in loosening of the joint, only shortly after stopping long-term successful antibiotic treatment (6-24 months). Thus, we feel that lifelong treatment with antibiotics is a reasonable alternative in cases, where the risk of surgery is very high.**

Key words: **Bacterial Arthritis, Skin Infections, Treatment Delay, Rheumatoid Arthritis.**

INTRODUCTION

Of the acute inflammation of the joint, bacterial arthritis is the most serious; its incidence has not decreased during the past decade despite improved ability to treat all kinds of bacterial infections (1-4). Patients with rheumatoid arthritis (RA) or systemic lupus erythematosus (SLE) are prone to develop septic arthritis, Staphylococcus aureus most frequently being the causative agent (5). In patients treated with immunosuppressive drugs as well as in intravenous drug users gram-negative micro-organisms often account for the infections (2). Bacterial arthritis has a high mortality rate especially in patients with RA (2-3). Severe joint destruction after bacterial arthritis is seen in patients with infections with virulent bacterial species, delayed diagnosis and/or insufficient treatment, especially in case of impaired immunity.

In this study we investigated the cause of bacterial arthritis, treatment, factors influencing the course of the disease, the function of the infected joints and X-ray abnormalities.

PATIENTS AND METHODS

All medical records of patients with bacterial arthritis, seen between 1977 and 1988 in the hospital 'Medisch Spectrum Twente' in whom a micro-organism in the synovial fluid was cultured, were reviewed. Patients with proven genital infection with Neisseria gonorrhoea and clinical signs and symptoms of septic arthritis were also included in this study, as it is not always possible to culture this micro-organism from synovial fluid (2).

The following data were assessed: age, sex, time between the first symptoms and start of treatment, concomitant diseases, medication, port of entry, type and number of affected joints, body temperature, erythrocyte sedimentation rate (ESR, Westergren), blood leucocyte count, the causative micro-organisms, treatment

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Table I: *X-ray grading of the affected joints before onset of bacterial arthritis and after antibiotic treatment (in 25 patients)**

		After treatment						
		I	II	III	IV	V	VI	total
Before treatment								
Normal	1	2	3	0	2	0	0	7
Osteoporosis	II	–	1	0	0	3	0	4
One or more cysts	III	–	–	2	0	0	0	2
Reduction of joint space	IV	–	–	–	4	2	0	6
Joint destruction	V	–	–	–	–	6	0	6
Ankylosis	VI	–	–	–	–	–	0	0

*Only patients, who were already under treatment of a rheumatologist before the onset of bacterial arthritis, in whom X-rays of the affected joint before onset of the bacterial infection were available. Range of the periods between the X-rays that were compared: 1-66 months, mean 12 months.

Table II: *Concomitant diseases on admission in the 72 patients with bacterial arthritis*

	No. of patients
Rheumatoid arthritis (RA)	29
RA and osteoarthritis	4
RA and diabetes mellitus	2
Diabetes mellitus	2
Osteoarthritis	5
Osteoarthritis and pseudogout	1
Gout	3
COPD	2
Carcinoma of the pancreas	1
Myelomatosis	1
Deep vein thrombosis (leg)	1
Perianal abcesses	1
Hypothyroidism	1
No concomitant diseases	19

given and antibiotics. Also data concerning the resulting function of the joint after the infection were compared with the function before onset of bacterial arthritis, using three gradations: unchanged, moderately impaired and seriously impaired, according to the data of the rheumatologists in the patients' records. In patients not known to a rheumatologist before the onset of bacterial arthritis because they had no rheumatic condition, the function of the affected joint was presumed to be normal before the infection. In patients who died shortly after onset of the infection these data are not available. X-rays of the joint were blindly scored by a radiologist (R.L.P.) in grades I (no deviations) to VI (ankylosis) (Table I). Statistical analysis was performed using Fisher's exact test and Student's t-test.

Table III: *Joints (n=87) affected in the 72 patients with bacterial arthritis*

	Number	%
Knee	37	42
Hip	11	13
Ankle	10	12
Shoulder	8	10
Wrist	7	7
Elbow	5	6
Metatarsophalangeal joint	4	5
Metacarpophalangeal joint	1	1
Sternoclavicular joint	2	2
Sacro-iliacal joint	1	1
Symphysis pubis	1	1

RESULTS

During the period 1977-1988, a total of 72 patients with bacterial arthritis were treated in our hospital: 37 females (mean age: 62, range: 26-88 years) and 35 males (mean age: 60, range: 8-86 years). Each year 4 to 8 patients with bacterial arthritis were seen, with the exception of 1986 (11 patients). Only 19 out of the 72 patients had no concomitant diseases at admission; the others suffered from various diseases, including 35 with RA (Table II). Prednisolone was taken by 15 patients, while 28 patients did not use any medication. Only one patient used cytotoxic drugs.

The delay between the first symptoms of septic arthritis and the start of antibiotic treatment was less than 24 hours in 25 patients and more than 2 weeks in 13 patients (maximum delay: 6 months); all other patients were admitted and treated between 1 day to 2 weeks after onset of the symptoms.

The symptoms most frequently encountered were: swelling and pain (N=18), fever and pain (N=8) loss of function and pain (N=7). In 33 patients pain was the only complaint. Bacterial arthritis occurred in almost every joint, but most frequently in the knee (Table III).

Infection of one joint occurred in 62 patients; 9 patients had two infected joints, one patient three infected joints and one patient even had five infected joints. In 9 patients prosthetic joints were infected.

A port of entry was found in 45 patients, as the same micro-organism could be isolated from the lesion and the synovial fluid with identical spectrum of resistance to antibiotics. In 15 cases this was an infection of the skin; none of them had been treated with antibiotics. In

Table IV: *Portal of entry in the 72 patients with bacterial arthritis*

	Number	%
Infection		
skin	15	20
urogenital	12	18
respiratory	3	4
intestinal	1	1
other	1	1
Intra-articular cortico-steroid injection	2	2
After operation		
prosthetic joint	3	4
other	1	1
Others	7	7
Unknown	27	39

Table V: *Micro-organisms cultured from synovial fluid**

	number	%
Staphylococcus		
aureus	38	52
epidermidis	3	4
Streptococcus		
pyogenes	8	11
group G	2	3
Gonococcus	2	3
Escherichia coli	5	7
Proteus mirabilis	1	1
Mycobacterium species	2	3
Anaerobic species	4	6
Mixed flora (staph. aureus and anaerobic bact.)	1	1
Other micro-organism	1	1

* n = 67; in 5 patients with proven genital gonococcal infection and symptoms indicating bacterial arthritis, cultures from the synovial fluid were negative.

17 patients joints became infected due to respiratory or urogenital infections. In two patients bacterial arthritis started after intra-articular corticosteroid injection. Shortly after a prosthetic joint implantation an infection occurred in three patients. In 27 patients the port of entry could not be proven (Table IV).

Causative bacteria are presented in Table V. Gram-positive aerobic bacteria were responsable for 70% of all infections, in most cases Staphylococcus aureus. Blood cultures were positive in 25 out of 51 patients (49%). In all of these 25 patients bacterial arthritis was diagnosed within one week after onset of first symptoms.

Blood leucocyte-counts were available in 66 patients and ranged between 3.1 and 25.8 $\times$ 10^9/liter (mean 11.2 normal 4.0-10.0); it was less than 10 $\times$ 10^9/liter in 37 patients. The ESR was performed in 68 patients and ranged between 12 and 146 mm after one hour (mean 83 mm). In 9 patients the ESR was less than 20 mm.

Table VI: *Treatment given to the 72 patients with bacterial arthritis*

	Number	%
Antibiotics only	16	24
Antibiotics and repeated needle aspirations	43	58
Antibiotics and drainage	7	10
Antibiotics and removal of the prosthetic joint	5	7
None (died within 24 hours)	1	1

In 43 patients therapy consisted of antibiotic treatment and repeated needle aspirations of the affected joint; 16 patients were treated with antibiotics only. Most patients received antibiotics parenterally during one week and afterwards orally. Only 7 patients were treated with an open drainage of the infected joint by an orthopaedic surgeon (Table VI): 2 knee joints, 1 metatarsophalangeal and 1 metacarpophalangeal joint, 1 elbow, 1 shoulder and 1 prosthetic joint of the hip. The indication for the open drainage was made in 2 cases by orthopaedic surgeons, in 2 by internists and in 2 also by rheumatologists and in 1 case by a surgeon. The exact reasons for the open drainages could not be recovered.

Nine patients had a total of 11 infected prosthetic joints; in 4 of them the prosthetic joint had to be removed shortly after onset of the infection, before the start of antibiotic treatment. The other 5 patients with 7 infected prosthetic joints received treatment with long-term antibiotics. All these 5 patients had a relapse of bacterial arthritis within 10 days of stopping antibiotic therapy administered successfully for 1/2 - 2 years. In one patient this resulted in loosening of the prosthetic joint, so that it had to be removed; in the other 4 patients in whom antibiotic treatment was restarted, no clinical or radiological signs of loosening were observed during a follow-up period of 2-10 years of continuing treatment. In patients with bacterial arthritis of non-prosthetic joints the period of antibiotic treatment ranged from 1 week to 36 months (mean: 21 weeks). In none of the patients treated with long-term antibiotic treatment, had signs of bacterial resistance developed.

Shortly after diagnosis 8 patients died; 4 of them suffered from RA, 2 had diabetes mellitus, 1 Parkinson's disease and one patient suffered from carcinoma of the pancreas. Of these 8 patients, 3 died due to septicaemia, 3 of pneumonia, 1 had perforation of a peptic ulcer and 1 cardiac insufficiency. The causative micro-organism of bacterial arthritis in the patients who died was Staphylococcus aureus in five cases and 1 case each of Escher-

Table VII: *Outcome of joint function in the 72 patients with bacterial arthritis**

	Impairment of joint function			Died
	None	Moderate	Serious	
Patients				
male	19(63)	6(20)	5(17)	5
female	14(41)	14(41)	6(18)	3
all	33(52)	20(31)	11(17)	8
Concomitant disease				
otherwise healthy	11(58)	6(32)	2(10)	0
RA	15(48)	9(29)	7(24)	4
other disease	7(50)	5(36)	2(14)	4
Therapy				
antibiotics (ab) only	8(57)	5(36)	1(7)	2
ab and aspiration	21(55)	12(32)	5(13)	5
ab and drainage	3(44)	2(28)	2(28)	0
prost. joint removal	1(20)	1(20)	3(60)	0
none	0	0	0	1
Treatment delay				
1 day	12(52)	9(39)	2(8)	3
1 day - 2 weeks	16(53)	8(27)	6(20)	4
more than 2 weeks	5(45)	3(27)	3(27)	1

* Number of patients (%); all subgroups concerning all 72 patients

ichia coli, Streptococcus group G and an anaerobic bacterial infection.

Joint function recovered in 33 of the 64 surviving patients (52%). In patients with concomitant diseases (Table II), impairment of joint function was not significantly worse than in previously healthy patients. This corresponds with data in the literature (3-5).

The frequency of deterioration of joint function was not significantly different in patients with RA (52%) compared with all other patients (45%), nor in men (41%) compared with women (63%).

Of the patients treated within 1 day after onset of symptoms, 52% had a full recovery of joint function and only 8% had serious impairment; of the patients treated after two weeks or longer these figures were 45% and 27% respectively: no statistically significant differences were observed (Table VII).

The mean period, however, between first symptoms and start of treatment in patients with serious impairment was significantly longer than in patients with no or moderate impairment of joint function; 30 versus 10 days ($p = 0.03$). In 25 of the 72 patients X-rays of the joints, made shortly after onset of the septic arthritis and after treatment were available for comparison. In 15 patients no change was detected (in 6 of them pre-existing damage due to RA already being maximal) and in 10 patients X-rays deteriorated (Table I).

DISCUSSION

The main reason for investigating the causes and outcome of bacterial arthritis in our hospital was the frequency of this serious condition seen in patients with RA. The incidence of bacterial arthritis in our study is in agreement with data in the literature as are the mortality rate (11%), the most frequent localization (knee), port of entry (skin lesions on lower extremities) and causative agent (Staphylococcus aureus)-(1-8). From these data we conclude that skin infections especially when localized on legs or feet of patients with RA should be treated without delay and that one should not hesitate to prescribe antibiotics. Nowadays we treat patients with bacterial arthritis for at least two weeks intravenously with antibiotics according to the literature, as parenterally administered antibiotics achieve a high concentration in the infected synovial fluid (1).

In other studies, involvement of sternoclavicular and sacroiiliac joints are often reported in intravenous drug users, gram-negative organisms frequently being causative agents, as in patients who are on cytotoxic drugs. An increased percentage of joint infections with these microorganisms from 6 to 25 is reported (2). In our study, however, we only saw two infections of the sternoclavicular joint and one of the sacroiliac joint and only 9% of all cases of bacterial arthritis were caused by gram negative organisms. Only one of these patients used cytotoxic drugs and none of them was addicted to intravenous drugs. This difference is most likely due to the fact that in our region use of intravenous drugs is much less common than in the city population of Boston, Massachusetts (2,5).

In contrast with others, we found that having RA did not lead to a worse outcome of joint function (3-5). This might be ascribed to a short treatment delay as these patients were already frequently seen by their rheumatologists, but the design of the study did not allow us to assess accurately functional outcome after infection, so we cannot draw major conclusions from this finding.

The ESR was less than 20 mm in the first hour in 9 of 68 patients (13%) and blood leucocyte count was less than 10×10^9/liter in 37 of 66 patients (55%); this shows that these parameters are not reliable in excluding bacterial arthritis. Although it is sometimes difficult to differentiate bacterial arthritis from noninfectious causes of inflammation, severe pain was the presenting symptom in most patients, and should alert the clinician. Then the first step always is to get a gram stain smear and a culture from the synovial fluid by removing as much fluid as possible for diagnostic and therapeutic purposes (1). Also blood cultures should be taken (in 49% of the cases positive in our series).

In 4 out of 9 patients with infected prosthetic joints the infection resulted in loosening of the joint before antibiotic treatment was started. In the other 5 patients bacterial arthritis recurred (in one patient resulting in loosening of the joint) only shortly after stopping long-term successful antibiotic treatment (6-24 months). Thus, we feel that lifelong treatment with antibiotics is an alternative if the risk for surgery is too high or if surgery is technically impossible.

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