CONCISE REPORT

No changes in the distribution of organisms responsible for septic arthritis over a 20 year period

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Objective: To assess changes in the distribution and resistance of the pathogens responsible for septic arthritis over a 20 year period in patients admitted to the same hospital unit.

Patients and methods: Retrospective study of the hospital records of patients admitted between 1979 and 1998 for septic arthritis with positive microbiological diagnosis after blood or joint cultures, or both.

Results: 303 cases of septic arthritis were studied, 141 in the period 1979–88 and 162 in the period 1989–98. The incidence between the first and second period did not vary significantly for the staphylococci (67% v 63%), streptococci (16% v 20%), and Gram negative bacilli (7% v 10%). Tuberculous infections decreased from 9% to 4% ($p < 0.04$). No gonococci were isolated in the second 10 year period. Among the staphylococcal species, there was an increase in the number of coagulase negative staphylococci (10 cases v 21, $p < 0.05$) between the two periods. There was no significant difference in the frequency of occurrence of methicillin resistant pathogens (12.6% v 16.6%). The number of streptococcal B infections increased (2 v 10 cases), and β -lactamine resistant pneumococci emerged. In the second 10 year period, patients were older and were more likely to have co-existing disease, particularly tumoral growth, and less commonly were receiving dialysis. Localisation of joint infection was comparable except for an increase in prosthetic knee infections.

Conclusion: The distribution and sensitivity of pathogens causing septic arthritis changed little over a 20 year period.

Managing septic arthritis is a common experience in many rheumatologists' practice. Despite advances in antibiotic treatment septic arthritis still results in considerable mortality in fragile patients^{1,2} and compromises function in half of all those affected.² Prognosis worsens when appropriate antibiotic treatment is delayed.³ In the absence of clear indications of the causative organism, the initial choice of antibiotics is an educated guess. Staphylococci and streptococci, the most commonly isolated pathogens, are targeted. However, studies^{4,5} have shown an increasing incidence of Gram negative bacilli, notably in the elderly and immunocompromised hosts.^{6,7} Other studies have shown an increasing incidence of methicillin resistant staphylococci⁸ and pneumococci,^{1,9} with the emergence of resistant strains.

To document changes in the populations of pathogens in septic arthritis we reviewed the files of patients admitted to our hospital unit over a period of 20 years.

PATIENTS AND METHODS

Records of adult patients admitted to hospital between 1979 and 1998 for septic arthritis were collected. The department is

a primary and secondary reference centre in a teaching hospital in a rural health district where AIDS and drug abuse are rare. Patients with positive blood and/or joint fluid cultures were included. Infections limited to the spine or sacroiliac joint were excluded. Age, sex, joint site, causative organism, and method of isolation, risk factors such as inflammatory rheumatism, joint prosthesis, steroid treatment, cancer, diabetes, haemodialysis, and HIV testing were recorded.

RESULTS

Over the 20 year period, 303 patients had culture proven septic arthritis. The annual number of cases was stable at around 15, rising to 20 in the past three years.

Bacterial identification was made in joint fluid (90% of cases) or in blood cultures (38.5%), or in both (28%). Staphylococcus was implicated in 95/141 (67%) cases in the first decade and 102/162 (63%) in the second decade (table 1). Streptococci and Gram negative bacilli tended to be more common in the second decade (22/141 (16%) v 33/162 (20%) and 10/141 (7%) v 17/162 (10%), respectively, NS) while tuberculosis decreased from 13/141 (9%) to 6/162 (4%) ($p < 0.04$). Gonococcal arthritis was uncommon, with three cases in the first and none in the second decade. Anaerobes and fungal infections were rare.

Most staphylococcal infections were due to *Staphylococcus aureus*. Coagulase negative staphylococci were more common in the second decade (10 cases v 21, $p < 0.04$). Of 31 cases of staphylococcal arthritis, 10 arose on prostheses and six others after joint injection or arthroscopy. Rheumatoid arthritis, renal failure and dialysis, and diabetes mellitus were present in four, three, and three cases respectively. The incidence of methicillin resistant staphylococci increased over the two decades (12/95 (12.6%) v 17/102 (16.6%), NS) but not that of *Staphylococcus aureus* (11/85 (12.9%) v 10/81 (12.3%)). A variety of streptococci were found. Pneumococci were rare but in two of the three cases of the past five years they were resistant to β -lactamines. The incidence of streptococci B also increased in the second decade (2 v 10 cases).

A variety of Gram negative bacilli were observed in the two decades, but haemophilus was found in only one case. Brucellosis was diagnosed three times in the first decade, never in the second.

Mycobacterium tuberculosis hominis was identified in 17 cases and other mycobacteria in 2. One patient of the first decade had arthritis due to *Mycobacterium bovis* and one in the second decade, a *Mycobacterium xenopi* arthritis. The only two fungal arthritides were due to *Scedosporium*.

There was a male predominance (table 2) and the average age rose from 58.3 to 65.4 years, owing to an increase in patients older than 60 (49% to 73%, $p < 0.0001$). Distribution of pathogens in the under and over 60 age groups was comparable. A systemic risk factor was more common in the second decade (33% v 45%, NS), owing to an increase in dialysis and patients with cancer. Only one case of AIDS was seen.

The joints affected were the same over the two decades. An increase in infected knee prostheses (6 v 16, $p < 0.02$) was balanced by a decrease of other knee infections (67 v 53, NS).

Staphylococci accounted for 70% of prosthetic knee infections, with a majority of coagulase negative (37.5%) and methicillin resistant (25%) organisms. Streptococci and Gram negative bacilli were found in 13% of cases. *Mycobacterium xenopi* infection arose on knee prosthesis. Germ species did not change significantly over time, a stability documented also in the analysis of prostheses as a whole.

Table 1 Organisms identified as causes of septic arthritis

	1979–88 n=141 (21)	1989–98 n=162 (27)
Staphylococci	95 (16)	102 (15)
Aureus	85 (12)	81 (7)
Methicillin resistant aureus	11 (2)	10 (2)
Coagulase negative	10 (4)	21 (6)
Coagulase-methicillin resistant	1 (0)	7 (3)
Methi R	12 (2)	17 (5)
Streptococci	22 (4)	33 (5)
Pneumococci	3	4
Streptococcus group A	4	3
Streptococcus group B	2 (1)	10 (3)
Streptococcus group C	2 (1)	2 (1)
Streptococcus group D enterococci	2	3
Streptococcus group D bovis	0	2
Streptococcus group F	1	0
Streptococcus group G	1 (1)	1
Non groupable	6	8
Sanguis	5 (1)	2 (1)
Mitis	0	3
Oralis	0	2
Constellatus	0	1
Typing not done	1	0
Gram negative bacilli	10 (1)	17 (4)
<i>E coli</i>	1	8 (3)
Salmonella	2	1
Proteus	1 (1)	1
Serratia	0	2
Pseudomonas	1	1
Acinobacter	0	1
Enterobacter	0	2
Haemophilus	0	1 (1)
Pasteurella	1	0
Campylobacter	1	0
Brucella	3	0
Anaerobes	1	2 (2)
Neisseria	3	0
<i>N gonorrhoeae</i>		
Mycobacteria	13 (1)	6 (1)
<i>M bovis</i>	1 (1)	0
<i>M xenopi</i>	0	1 (1)
Fungi	0	2
Several organisms	3 (1)	0

Number of infected prostheses are shown in parentheses.

Table 2 Risk factors for septic arthritis. Results are shown as No (%)

	1979–88 (n=141)	1989–98 (n=162)	p Value
Men	91 (65)	93 (57)	
Age (years)	58.3	65.4	
>60 years	69 (49)	118 (73)	<0.00005
Prosthesis	21 (15)	27 (17)	
Risk factor	47 (33)	73 (45)	<0.03
RA	19 (13)	22 (14)	
Diabetes	19 (13)	20 (12)	
Steroid treatment	21 (15)	25 (15)	
Tumoral growth	2 (1)	14 (9)	<0.003
Dialysis	1 (1)	6 (4)	
HIV	1 (1)	0	

DISCUSSION

The expected decrease in incidence of septic arthritis was not seen over this 20 year period. Better bacteriological methods such as our direct seeding of synovial fluid in flasks of blood culture immediately after aspiration, which has become mandatory in the past 10 years, may have increased the number of culture proven cases. The increase in systemic risk factors was related to the number of patients over 60, who represented 73% of cases in the second decade.

Staphylococci frequency decreased only slightly over 20 years, and stayed at around 66%. They are the most common organisms in all published series, as in ours (table 3).^{1 4 5 10–20} In recent studies, however, they were less predominant.^{9 16 21} In a prospective multicentric study of septic arthritis diagnosed in 1990, 1991, 1992, 1993 in the Amsterdam health district, only 55% of non-gonococcal, non-tuberculous cases were due to staphylococci.²¹ Similarly, in the same period a survey involving 210 English and Welsh laboratories,⁹ documented a decreased staphylococci predominance (44%).

Coagulase negative staphylococci were found in 15% of our staphylococcal arthritides, and increased over the second decade. In other published reports this rate ranges from 0 to 32%. They occurred in 14% of staphylococcal arthritides in the Amsterdam study,²¹ in which 17% of joints had undergone replacement or similar treatment, but in only 3% of cases in the British study,⁹ which also included prosthesis infection. Joint injection infections, primary prosthesis infections, and immunocompromised host infections are susceptible to coagulase negative staphylococci. In addition, the susceptibility may account for changes in the second decade, where dialysis and knee prostheses were more numerous.

Resistance to antibiotics appeared early in their use in septic arthritis. A review by Newman¹⁷ showed that from 1944 to 1953, 29% of *Staphylococcus aureus* were resistant to penicillin G and 59% from 1964 to 1973. Resistance rose to 80% between 1973 and 1982 according to Cooper and Cawley,¹⁰ and 72% in a later multicentric study by Kaandorp *et al*.²¹ The emergence of methicillin resistant *Staphylococcus aureus* is a matter of concern. Ang-Fonte *et al* found that 39% of *Staphylococcus aureus* in 1981–82 were methicillin resistant compared with none in 1966–77.⁸ Most cases were seen in intravenous drug users. Our results are less alarming because only 10% of the *Staphylococcus aureus* isolated were methicillin resistant. There was no change in incidence over the two decades. However, our health district is still largely rural. Resistance of coagulase negative staphylococci increased in the last three years of the study (NS). Most infections were nosocomial.

Streptococci were found in the second largest number, accounting for 55/303 (18%) of our cases. Their frequency, slightly higher in the second period (16% to 20% NS), was comparable with that of the Amsterdam study (21%)²¹ but lower (28%) than in the British series.⁹ We found pneumococci in 13% of streptococcal arthritides. This figure did not change over time, but we observed the emergence of their resistance to β -lactamines. The rate was comparable with that reported in France²⁰ and elsewhere. Comparison is compounded by a higher frequency of pneumococci in the Amsterdam (19%)²¹ and British studies (35%).⁹ We rarely found streptococci A. Streptococci B and non-groupable streptococci were common (12/55 (22%) and 14/55 25%, respectively). Streptococci B increased in the second decade. Our findings concur with two time-point studies^{9 21} showing a high frequency of streptococcus B in years 1990 to 1993 but not with the longitudinal study of Schattner and Vosti.²²

Gram negative bacilli accounted for 9% of pathogens in our cases compared with 19% and 17% in the British⁹ and the Amsterdam surveys.²¹ The elderly were not more susceptible, as they were in previous reports.⁷ *Brucella* was absent in the second decade. *Haemophilus influenzae*, which predominates in infants, was identified in only one of our patients, who were all adults.

Table 3 Pathogens responsible for non gonococcal non tuberculous septic arthritis. Results shown as mean percentages (range)

	Present series (n=281) 1979-98	Other published series* (n=1200)	SFR series† (n=634) 1980	Ryan <i>et al</i> ‡ (n=1062) 1990-93	Kaandorp <i>et al</i> § (n=175) 1990-93
Staphylococci	70	63 (29-82)	66	44	55
of which <i>S. aureus</i>	84	90 (68-100)		97	86
Streptococci	20	20 (4-39)	18	30	21
of which <i>Pneumococci</i>	13	12 (0-28)	15	35	19
Gram negative	10	16 (5-37)	19	21	17

*Series comprising more than 50 culture proven cases; †survey of the Société Française de Rhumatologie²⁰; ‡survey of reports from laboratories in England and Wales⁵; §community survey in the health district of Amsterdam.²¹

Neisseria gonorrhoeae seemed to have been eradicated during our study period, as found in other European studies,^{9, 21} but in contrast with America, where it accounted for one in five cases according to Manshady *et al.*¹⁴ and Goldenberg *et al.*⁵ and one in two according to Sharp *et al.*¹⁹ *Neisseria gonorrhoeae* is the commonest cause of septic arthritis in young adults.²³ Tuberculosis decreased in our study from 9% in the first decade to 4% in the second. Mycobacteria were isolated in 7.7% of cases in the British survey,⁹ with a possible overrepresentation according to the authors. In the Amsterdam study,²¹ mycobacteria accounted for 2.7% of cases, with *M. hominis* accounting for 90% of all mycobacteria in the British study as in ours.

The limited changes we describe should alleviate concern over a rise in antibiotic resistance in septic arthritis. The rules of hygiene and medical care prevailing in our health district are probably responsible in part for this reassuring finding. In Australia, the same reassuring picture has emerged.²⁴ Furthermore, areas in which drug abuse, AIDS, and antibiotic overprescription are prevalent, but decreasing, will soon present similar features for septic arthritis.

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