Table 1 Serological and clinical evolution of the patient described

Time	IgG	IgM	Manifestation	Therapy
0	1:512	1:32	Left eye retinitis	Azithromycin plus rifampin
4 weeks	1:1024	1:256	Left eye retinitis	Azithromycin plus rifampin
8 weeks	1:1024	Negative	Resolved	Stop

presented with cat scratches on her neck, as a consequence of which she suffered from ocular bartonellosis without the typical systemic symptoms of CSD. In immunocompetent patients, ocular disease usually develops after systemic involvement has subsided, suggesting that ocular involvement represents a late complication of the disease [6,7]. However, sometimes the acute phase cannot be recognized and *Bartonella* DNA has been demonstrated in the ocular fluids as long as 1 year after the start of the symptoms. Ocular bartonellosis is mainly associated with *B. henselae* infections. This association is predominantly based on serological grounds [6,8]. The characteristic evolution of IgG and IgM serology against *B. henselae* in the serum of this patient supports the hypothesis of acute infection with ocular localization.

Previous studies based on serology were performed mainly by IFA, and no specific IgM titers were determined for these patients [6,9]. In this case, the diagnosis of *B. henselae* ocular infection was based on the demonstration of the presence of IgM.

Therapy with rifampin and azithromycin was effective. Prospective clinical studies evaluating this antibiotic association in *B. henselae* infection are warranted.

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Polyclonal *Staphylococcus epidermidis* intravascular catheter-related infections

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During a 4-month period we prospectively investigated the frequency of polyclonal catheter infections with *Staphylococcus epidermidis*. Of each catheter with pure growth of *S. epidermidis*, six colonies were genotypically analyzed with pulsed-field gel electrophoresis. Two out of 12 patients with catheter infection had a polyclonal infection. Both clones of each catheter had a clearly different antibiotic susceptibility. This study shows that polyclonal catheter infections are not exceptional. Further studies are needed to define the clinical consequences of polyclonal catheter infection.

INTRODUCTION

Nosocomial bacteremia is frequently caused by catheter-related infections and *Staphylococcus epidermidis* is the single most frequently isolated pathogen [1]. These infections usually are considered monoclonal (originating from a single clone), and antibiotic susceptibility testing is carried out using a subculture of a single colony taken from the catheter culture. In 1997, we described a patient with polyclonal *S. epidermidis* prosthetic valve endocarditis [2]. More recently the polyclonal nature of joint prosthesis infections with *S. epidermidis* was described [3] and the genetic variability of an infecting *S. epidermidis* strain during prosthetic valve endocarditis was shown [4]. Polyclonality of infections may result in inadequate and misleading antibiotic susceptibility testing, because only one colony is tested, in general. However, the prevalence of polyclonality in catheter-related infections with *S. epidermidis* has never been determined. In the present observational study we investigated the prevalence of polyclonal *S. epidermidis* catheter-related colonization and infection.

METHODS

In the medical microbiology laboratory of a 1900-bed university teaching hospital, bacterial isolates from catheters with a pure growth of *S. epidermidis* were collected prospectively. The catheters were quantitatively cultured using the sonication technique [5]. For inclusion in the study, >1000 colony-forming units (cfu)/catheter had to be present on the catheter. Staph-Zym (ROSCO, Taastrup, Denmark) was used for the phenotypic identification of *S. epidermidis.* The treating physician and medical records were consulted both at catheter removal and 48 h later to collect the clinical data needed. From each catheter culture, six colonies were taken randomly, inoculated in brain–heart infusion broth, grown for 4 h and then frozen until further analysis. Genotypic analysis of these isolates was performed using *Sma*I digestion (Gibco-BRL, Gaithersburg, MD, USA) of chromosomal DNA, and restriction fragments were separated by pulsed-field gel electrophoresis (PFGE) using the CHEF Mapper System (Bio-Rad, Hercules, CA, USA) in 1% (wt/vol) chromosomal grade agarose gels (Bio-Rad). Electrophoresis was performed at 200 V with alternating pulses at a 120° angle in a 5–15 s pulse time gradient for 10 h and then a 15–45 s gradient for the next 12 h [6]. Polyclonality was defined as described by Tenover et al. [7]. Catheters in which the investigated clones showed a difference of four bands or more were considered polyclonal. If clones differed in fewer than four bands, they were considered genotypically closely related. Antibiotic susceptibility testing was done by the agar dilution method at breakpoint concentrations. Chloramphenicol and doxycycline susceptibility was tested using the disk-diffusion method (neoSensitabs, ROSCO, Taastrup, Denmark). Methicillin resistance was confirmed by the presence of the *mecA* gene, determined by PCR, as described by Murakami [8]. Catheter-related infection was defined as the presence of a catheter with >1000 cfu/catheter retrieved from a patient with fever and in whom the fever disappeared within 48 h following catheter removal. Because fever is rare in neonates, the prompt disappearance of signs (apnea, bradycardia) after the catheter removal was accepted for the definition of catheter-related infection in this population. Catheter-related bloodstream infection was defined as a catheter with >1000 cfu/catheter and two peripheral blood cultures positive for *S. epidermidis*. Sepsis had to resolve within 48 h after removal of the catheter. Because it is difficult to obtain two peripheral blood cultures in neonates, one positive peripheral blood culture with *S. epidermidis* was considered significant in this population. Colonization of a catheter was defined as a catheter growing >1000 cfu/catheter in a patient without documented bacteremia in whom the symptoms of sepsis did not resolve after catheter removal.

RESULTS

During a 4-month period (two periods of 2 months) all 15 catheters with a pure growth of *S. epidermidis* obtained from 15 patients were studied. Fourteen of these 15 catheters were central venous catheters and six were from neonates. Nine patients had catheter-related bloodstream infection, three had a catheter-related infection without bloodstream infection and three had catheter colonization without infection. *Sma*I

Table 1 Antibiotic susceptibility of different clones of patients 4 and 13 with polyclonal catheter infection-colonization

Patient	Clone	Pen	Oxa	Ery	Clin	Dox	Co	Ofl	Gen	Tob	Am	Chl	Van
4	a	R	*R*	*R*	*I*	S	S	S	S	S	S	S	S
	b	R	*S*	*S*	*S*	S	S	S	S	S	S	S	S
13	a	R	*R*	*R*	S	S	S	S	S	*I*	S	S	S
	b	R	*S*	*S*	S	S	S	S	S	S	S	S	S

Chl, chloramphenicol; Co, cotrimoxazole; Gen, gentamicin; Tob, tobramycin; Am, amikacin; Ofl, ofloxacin; Pen, penicillin; Oxa, oxacillin; Ery, erytromycin; Clin, clindamycin; Dox, doxycycline; Van, vancomycin.
Differences in antibiotic susceptibility between clones a and b are in italic.

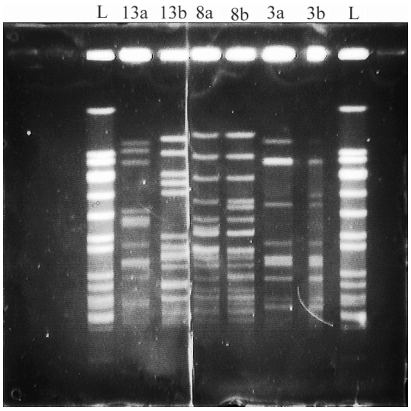

Figure 1 Pulsed-field gel electrophoresis pattern of one polyclonal catheter (patient 13), one with genotypically closely related but distinguishable clones (patient 8) and one strictly clonal infection (patient 3).

digestion of bacterial DNA and PFGE were performed on 90 colonies (six colonies of 15 catheters). Cultures from two of the 15 catheters (patients 4 and 13) proved to be polyclonal. On each of these catheters, two distinct clones were found. In patient 13, a neonate with catheter-related bloodstream infection, one clone was found in two of the six colonies tested and the other clone was found in the remaining four colonies. In patient 4, an adult patient with catheter-related infection, one clone was isolated in only one of the six colonies tested. The antibiotic susceptibilities of these four different clones are shown in Table 1. Although phenotypic methicillin resistance could be demonstrated in only one of the clones from patient 13, the *mecA* gene was demonstrated in both clones. In patient 4, the *mecA* gene could only be found in the methicillin-resistant clone. In one patient (patient 8), two closely related but not identical clones were found. However, the antibiotic susceptibility of both clones was exactly the same. Figure 1 shows the pulsed-field pattern of the distinct clones of patient 13, as well as the closely related but not identical isolates of patient 8 and the identical isolates of catheter 3.

DISCUSSION

Although catheter-related infection with *S. epidermidis* is considered to be monoclonal, several observations suggest the polyclonal nature of foreign-body infections with *S. epidermidis* [2,3]. In 15 consecutive catheters infected or colonized with *S. epidermidis*, we found two cases of polyclonal infection. If only the 12 patients with catheter infection or catheter-related bloodstream infection are taken into account, polyclonal infection was found in two of these 12 patients. We performed a genotypic analysis of only six colonies of each catheter. It is possible that more polyclonal infections would have been identified if more colonies had been analyzed but PFGE is very labor-intensive and we arbitrarily decided to limit the number to six. In the two polyclonal catheter infections, we found a good correlation between the antibiogram of the different clones and the PFGE pattern. Thus, performing an antibiogram on several clones might have given the same clinically relevant clonal differentiation. The colonies tested were selected after 48 h of growth and, at that time, no differences in colony morphology were observed. It is impossible to verify whether each of the different strains are equally responsible for the catheter-related infection, as theoretically some strains may colonize the catheter and others may actually infect the catheter. As no difference in colony morphology was demonstrated when the strains were recovered for further PFGE, it was impossible to demonstrate quantitatively the polyclonality any further because it is not possible to genotype all colonies from each patient. As a consequence we cannot say with certainty which of the genotypes was predominant and if all genotypes were present in >1000 cfu/catheter. Polyclonal infections with *S. epidermidis* were previously demonstrated in a case of prosthetic valve endocarditis [2] and in prosthetic joints infections [3].

CONCLUSIONS

Our study suggests that polyclonality of catheter infections, a frequent foreign-body infection, is not exceptional. *S. epidermidis* foreign-body infections are difficult to treat for several reasons. Polyclonality might be one of the explanations. Although it might be tempting to use vancomycin for all *S. epidermidis* catheter infections because of concerns about polyclonality, antistaphylococcal penicillins are preferable when a single sensitive clone causes the infection. However, it might be wise to use vancomycin in those patients who have no clinical response to treatment with antistaphylococcal penicillins when catheter removal is not possible (e.g. operatively implanted catheter). Our study also suggests that in *S. epidermidis* foreign-body infections, the finding of a genotypically different clone during a second episode of infection does not necessarily mean reinfection. It might just as well be a relapse of an (inadequately treated) polyclonal infection.

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Recurrent bacteremia by *Chryseobacterium indologenes* in an oncology patient with a totally implanted intravascular device

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Chryseobacterium indologenes was isolated from the blood cultures of an oncological patient with a totally implantable device. Because a catheter-related infection was suspected, the Port-A-Cath® was removed after a 10-day course of piperacillin–tazobactam. Differences in susceptibility may exist if either the criteria for either *Pseudomonas* or *Enterobacteriaceae* are used.

INTRODUCTION

Totally implantable intravascular devices are used to administer drugs to patients with a malignant disease. These devices offer the advantage of improved patient image and obviate the need for routine catheter-site care. However, pathogenic and opportunistic bacteria can contaminate indwelling catheters, especially in the hospital environment. The device can then become a reservoir for further dissemination of the bacteria. We report a case of an oncology patient with a totally implantable intravascular device (Port-A-Cath®, PAC) that became contaminated with *Chryseobacterium indologenes*.

CASE REPORT

In October 1999, a 38-year-old woman was diagnosed with bone and liver metastases of an already locally and regionally advanced breast cancer. Because of the severity of the hypercalcemia and associated symptoms (the patient underwent a successful resuscitation because of ventricular fibrillation), urgent renal dialysis was performed. Two weeks later a chemotherapeutic regimen of CAF (cyclophosphamide–adriamycine–5-fluorouracyl) together with biphosphonates was started in a day-patient setting. The drugs were administered through the PAC on days 1 and 8, and repeated every 28 days. On day 8 of this first cycle the patient was urgently admitted to the hospital because of a relapsing hypercalcemia. Laboratory investigations revealed no neutropenia. Within half an hour after manipulation of the PAC she experienced a fever of 39 °C. Apart from the tumor in the right breast, physical examination revealed no abnormalities. The patient was started on a combination of intravenous piperacillin and tazobactam (4×4 g IV daily).

One day after blood cultures were taken, bacterial growth was detected with a Bactec 9240 (Becton Dickinson Diagnostic Instruments System, Sparks, MD, USA) in the aerobic blood culture bottles (Bactec™ Plus Aerobic) collected from two different samples. The first sample was through a venous puncture; the second sample was through the PAC of the patient. The anaerobic blood bottles cultured negative.