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Case Report

Staphylococcus caprae meningitis following intraspinal device infection

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A case is reported of *Staphylococcus caprae* meningitis due to infection of an intraspinal analgesia pump. The subclinical and pauci-symptomatic clinical course of the infection strongly suggested a chronic device contamination.

Introduction

Coagulase-negative staphylococci have been reported more and more frequently as a cause of nosocomial infections, particularly after the implantation of foreign materials and/or in immunocompromised patients (Kloos & Bannerman, 1994; Rupp & Archer, 1994). The species that most frequently causes disease in humans is *Staphylococcus epidermidis*, but other coagulase-negative species are increasingly recognized as human pathogens. *Staphylococcus caprae*, for instance, is usually associated with animals, especially goats, but shows an increasing trend as a human pathogen infecting implanted foreign bodies (Blanc *et al.*, 1999; Arciola *et al.*, 2006). Other infrequent human *S. caprae* infections include bone and joint infection, urinary tract infection, sepsis/bacteraemia, recurrent sepsis, endocarditis and acute otitis externa (Shuttleworth *et al.*, 1997; Vandenesch *et al.*, 1995; Ross *et al.*, 2005; Takemura *et al.*, 2000; Roland & Stroman, 2002).

The insertion of intraspinal catheters and infusion-pump devices is an increasingly common treatment for severe chronic pain; on occasion, these devices have been the source of serious spinal and meningeal infections, the rates of the latter having been reported to be as high as 16 % (Schoeffler *et al.*, 1986; Chan & Dasey, 2007). The present paper appears to be, to the best of our knowledge, the first report of *S. caprae* meningitis following the infection of an intraspinal device.

Case report

A 47-year-old woman was admitted to our unit to investigate the cause of a recurrent fever. The patient's personal history documented three surgical attempts for the reduction of lumbar-sacral spondylolisthesis with anteroposition of the vertebra L5 on S1, the last of which had taken place 10 years earlier. None of these attempts had been effective for the control of a continuous and severe back pain syndrome that had manifested itself several years before and that was progressively worsening despite the placement of a spinal cord electrostimulator 7 years previously. Thus, 5 years before the present admission, a spinal analgesia pump was inserted so that long-term intrathecal morphine therapy could commence.

For 18 months prior to this admission, the patient noted a progressive deterioration of her condition and particularly in her ability to maintain a standing position and walk even for a short distance; furthermore, for the past 6 months she had complained of a persistent headache that was refractory to treatment. Although the microbiological cultures from the pump reservoir performed at 3-month intervals in the pain outpatient clinics had been consistently negative, the spinal infusion pump was eventually removed about 9 months prior to admission and replaced with a new device. However, intermittent high fevers which spontaneously resolved in few hours began again about 3 months later. The patient had been referred to the Infectious Diseases Clinics of our hospital for the screening of fever and was eventually hospitalized due to the progressive worsening of the clinical picture, particularly headache and tottering. Upon admission, the patient appeared very sick, exhibited irregular febrile spikes up to 39 °C, and complained of severe frontal headache and point-tenderness over the maxillary sinuses. She also complained of a stiff back and was noted to have a subtle alteration of her mental status (slight obtundation) but had neither a stiff neck nor any other signs of meningeal irritation. The neurological examination did not reveal any cranial nerve palsies, signs of increased intracranial pressure, or focal neurological deficits. Blood tests,

Abbreviation: CSF, cerebrospinal fluid.

including inflammatory markers, were completely normal. Screening results for neoplasms and auto-immune conditions (chest X-ray; cerebral and abdominal CT scans; tumour markers AFP, Ca 19-9 and CEA; thyroid panel; complement fractions; indexes of rhabdomyolysis CPK, myoglobin, troponin; and auto-antibodies) were in the normal range. Repeated blood and urine cultures were sterile, and the tuberculin skin reaction was negative.

A lumbar puncture was performed. The cerebrospinal fluid (CSF) obtained was clear and exhibited a normal pressure, but showed a definite increase in white blood cell count (176 cells mm^{-3}, mostly neutrophils), a decrease in glucose (31 mg dl^{-1}; normal range, 45–80), a slight increase in protein (55 mg dl^{-1}; normal range, 15–45) and normal lactic acid concentration.

S. caprae was yielded from four consecutive CSF cultures drawn by sequential lumbar punctures. Colonies on horse blood agar at 35 °C were white, circular, raised, non-haemolytic, 1–2 mm in diameter after 24 h and slightly larger after 48 h. Biochemical typing was carried out by the ID 32 STAPH System (bioMérieux) and speciation was obtained using the apiWEB identification software. Antibiotic susceptibility testing was performed on Mueller–Hinton agar plates by the disc diffusion method (BBL Sensi-Disc Antimicrobial Susceptibility Test; Becton Dickinson Microbiology Systems), according to the CLSI recommendations (CLSI, 2001). The strain was resistant to penicillin but otherwise fully sensitive to all other agents tested, including oxacillin, amoxicillin/clavulanate, netilmicin, erythromycin, clindamycin, ciprofloxacin, rifampicin, trimethoprim/sulfamethoxazole and vancomycin.

Upon the patient's request and previous agreement with the pain clinic's medical staff, the spinal pump was initially left in place and medical treatment was started with i.v. oxacillin plus rifampicin. The patient became afebrile after 6 days of treatment. However, since CSF cultures were still positive for *S. caprae* after1 week of antibiotic therapy, the device was then removed and the same *S. caprae* strain was also cultivated from the catheter tip. Oxacillin plus rifampicin were administered for 2 weeks following pump removal until this therapy had to be withdrawn due to the emergence of drug-related rash and fever. Antibiotic treatment was therefore restarted with i.v. trimethoprim/sulfamethoxazole for 2 weeks followed by a further 2 weeks of trimethoprim/sulfamethoxazole orally. CSF culture became negative 1 month after commencing antimicrobials and the patient was discharged from the hospital shortly afterwards. An outpatient CSF culture performed 2 weeks post-discharge remained culture-negative and clinical follow-up was satisfactory. Pain control was obtained with oral morphine treatment (400 mg daily) until a new infusion pump was positioned a few months post-discharge. In the year since then, no other infectious episodes have been recorded, and the patient remains clinically stable.

A spinal CT scan performed during the patient's hospital stay revealed calcifications in the intervertebral disc D7–D8 which partially protruded into the spinal canal; however, catheter-tip inflammatory mass, a common side-effect of long-term intrathecal morphine therapy (Ruan, 2007), could not be demonstrated. Interestingly, as already noted, inflammatory markers (erythrosedimentation rate, serum C-reactive protein and serum fibrinogen) were consistently normal despite a long-term infection history.

Discussion

The segregation of the small-colony variants subpopulation has been proposed as an explanation for the enhanced pathogenicity and survival of some coagulase-negative staphylococcal strains (Proctor & Peters, 1998). However, although production *in vitro* appears to be variable, biofilm production from some human and goat *S. caprae* strains has been well documented (Bedidi-Madani *et al.*, 1998). Biofilm formation is thought to be a biphasic process that requires the adhesion of bacteria to a substrate surface followed by cell–cell adhesion to form the multiple layers of the biofilm. The *ica* operon, which is involved in the *in vitro* synthesis of the oligomers that are required for biofilm formation, displays a higher prevalence among *S. epidermidis* isolates responsible for catheter and prosthesis infection than among those isolated from normal skin and mucosa of healthy controls (Allignet *et al.*, 2001); in the same study, however, *ica* was detected in all *S. caprae* isolates tested, regardless of their source, suggesting that biofilm production may be a common finding in this species. In addition, adherence to polystyrene, also indicating slime production, is a trait already documented in *S. caprae* (Allignet *et al.*, 1999) which may contribute to the virulence and to the protection against antibiotic access.

In the case described here, *S. caprae* may have infected the intraspinal pump either upon its insertion or, more probably, during one of the frequent manipulations of the device required for pump recharge.

Although biofilm formation was not investigated by electron microscopy, the subclinical and pauci-symptomatic clinical course of the infection strongly suggests a chronic device contamination, supported by the ability of the infecting *S. caprae* strain to adhere to a catheter line.

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