**Tsukamurella tyrosinosolvens**

Intravascular Catheter Infection Identified Using 16S Ribosomal DNA Sequencing

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Cultures of blood from a hemodialysis line repeatedly yielded a gram-positive rod. The organism was identified as *Tsukamurella tyrosinosolvens* by 16S ribosomal DNA sequencing, and the patient was treated successfully by removal of the line.

**Case report.** A 43-year-old Chinese man presented to the hospital with a 1-week history of fever and flu-like symptoms and pain related to a tunneled internal jugular hemodialysis line (Perm cath; Quinton). The patient had been undergoing hemodialysis for the treatment of end-stage renal failure for 3 years, and had small kidneys, which were presumed to be secondary to hypertension. The current line had been in position for 2 years. Examination revealed a temperature of 37.3°C, which spiked to 40°C while the patient underwent dialysis. There was tenderness over the point of entry of the line into the central vein, but there was no sign of tunnel inflammation. The WBC count was 13.9 x 10^3 cells/L and the C-reactive protein (CRP) level was 271 mg/L.

A diagnosis of line infection was made, and blood samples were obtained for culture prior to the start of intravenous vancomycin and gentamicin therapy. Blood cultures yielded a gram-positive rod, which was identified as a *Corynebacterium* species. After 1 week, the patient was afebrile (WBC count, 4.6 x 10^3 cells/L; CRP level, 70 mg/L). He resumed outpatient dialysis and received an additional 4 weeks of intravenous vancomycin and gentamicin therapy.

Eight months after completion of treatment, the patient was readmitted to the hospital with a recurrence of his symptoms, and, once again, blood cultures yielded a gram-positive rod. On this occasion, he was treated with teicoplanin and ciprofloxacin, which resulted in defervescence on day 10. After this time, an arteriovenous fistula was formed (the patient received perioperative prophylaxis with cefuroxime and flucloxacinillin), and the patient was discharged without receiving additional antibiotic therapy. He subsequently remained asymptomatic.

As it is normal practice on our nurse-led, low-dependency dialysis unit to perform blood cultures for any patient with a temperature of >37.3°C, routine blood cultures were performed during the following 3 months, because an intermittent low-grade pyrexia was noted in the patient. Culture results were positive on 4 further occasions for organisms initially identified as *Corynebacterium* and *Bacillus* species. Despite his fever, the patient remained healthy and did not receive any additional antibiotics. Because the blood samples for cultures were obtained some weeks apart and the cultures did not appear, initially, to yield the same organism, the culture results did not draw the attention of either the medical or the laboratory staff. However, as the isolate had an unusual antibiogram, on the fourth occasion the organism was sent to a reference laboratory, where it was initially identified as *Nocardia otitidiscaviarum* on the basis of biochemical tests. Detailed questioning of the patient by way of an interpreter revealed no new symptoms at this point. Findings of a physical examination and chest radiography were normal. Treatment with cotrimoxazole and amikacin was started (MICs determined by the reference laboratory were 0.125 mg/L and 4 mg/L, respectively) and the hemodialysis line was removed. Antibiotics therapy was continued for an additional week. Culture of the catheter tip grew the same organism as that grown on blood cultures. The patient subsequently remained healthy and afebrile, with negative blood culture results, a CRP level of <10 mg/L, and a normal WBC count.

Sequencing of 16S rDNA was performed on 4 separate isolates of the organism (3 from blood cultures and 1 from the culture of the catheter tip). Analysis of consensus sequences for all 4 isolates showed at least a 99% sequence identity with *Tsukamurella tyrosinosolvens* over 1290 base pairs (expect value, 0.0).

Informed consent for publication was obtained from the patient.

**Discussion.** *Tsukamurella* species are environmental or-
ganisms that are closely related to the genera *Mycobacterium*, *Nocardia*, *Rhodococcus*, *Gordona*, *Dietzia*, and *Corynebacterium*. *Tsukamurella* species are rare causes of pulmonary and soft tissue infections [1]. *Tsukamurella* species other than *T. tyrosinosolvens* have been implicated in occasional case reports of line infections, particularly in profoundly immunocompromised individuals [2], and, in one instance, in a patient who was undergoing hemodialysis [3]. Peritonitis related to continuous ambulatory dialysis has also been described [4].

To our knowledge, this is the first reported case of intravascular catheter infection caused by *T. tyrosinosolvens*. The species was first described in 1997 on the basis of 16S ribosomal RNA sequencing and chemotaxonomic analysis [5]. Isolates were recovered from cultures of blood obtained from 2 patients with infected cardiac pacemakers and from cultures of sputum obtained from 2 patients with chronic pulmonary infection. There have been no subsequent reports implicating *T. tyrosinosolvens* in clinical infections.

The difficulty in identifying the organism by phenotypic methods suggests that *T. tyrosinosolvens* and related species may well be underdiagnosed as a cause of line infections. Over time, our isolate was identified variously as a *Corynebacterium* species and a *Bacillus* species, both of which are liable to be dismissed as contaminants. This highlights the importance of the serious consideration and effective identification of all isolates in patients who have an indwelling catheter.

For the purpose of identifying unusual gram-positive rods, 16S rDNA sequencing is a relatively rapid and reliable technique and an effective alternative to the time-consuming and expensive combination of biochemical and gas liquid chromatography profiling, for which the expertise of a reference laboratory is needed. As sequencing technology becomes more widely available, the identification of gram-positive rods is an area of clinical practice where such technology will be extremely useful. It is likely that more such organisms will be implicated in clinical infections as the technique becomes widespread.

Our case also adds weight to previous reports that have suggested that *Tsukamurella* can only be effectively eradicated by line removal. In the case we describe, earlier identification of *T. tyrosinosolvens* as the cause of infection might have enabled the line to be removed sooner.

In summary, we present the first documented case of intravascular catheter infection caused by *T. tyrosinosolvens*, which was identified by 16S ribosomal DNA sequencing and effectively treated by removal of the line.

**References**