Recurrent *Staphylococcus lugdunensis* Osteomyelitis of the Lumbar Spine in a Patient on Chronic Hemodialysis

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**Abstract**

*Staphylococcus lugdunensis* is an emerging coagulase-negative *Staphylococcus* regarded as a formidable pathogen capable of causing significant infections at various body sites including bone and joints. We report the case of a Caucasian elderly male with recurrent lumbar osteomyelitis due to *S. lugdunensis*. He had a history of chronic low back pain. Besides chronic kidney failure and need for hemodialysis, he had no other history of immunosuppression. He did not have fever or leukocytosis; however, the erythrocyte sedimentation rate was elevated, and repeated blood cultures from the periphery and the hemodialysis access (tunneled catheter) were continuously positive for *S. lugdunensis*. The diagnosis was made by bone biopsy and culture. The bacteremia cleared after removing of the dialysis catheter. The patient received 8 weeks of antibiotic therapy for the osteomyelitis.

**Keywords:** Dialysis catheters, osteomyelitis, *Staphylococcus lugdunensis*

**Introduction**

*Staphylococcus lugdunensis* is a coagulase-negative *Staphylococcus* that has emerged over the past three decades as an important pathogen. It has been implicated in a wide variety of infections. Despite being a coagulase-negative *Staphylococcus*, its virulence has been well documented and respected as higher than other coagulase-negative staphylococci.[1-2] A feared complication of bacteremia with *S. lugdunensis* is infective endocarditis, often characterized by a destructive course of disease and high mortality rate.[3] *S. lugdunensis* has the ability to cause skin/soft tissue and foreign body-related infections including catheter-related bacteremia, ventriculoperitoneal shunts, and prosthetic joint infections.[4] Bone infections have been reported with infrequent involvement of the vertebral spine. From 1996 to 2003, three cases of vertebral osteomyelitis were reported in immunocompetent and immune-compromised patients.[4-6] Of the 70 cases of *S. lugdunensis* infections reviewed by Klotchko et al., nine had osteomyelitis with one involving the vertebral spine.[5] Taylor et al. reported two cases of spinal metalware infections.[7] We report the case of recurrent vertebral osteomyelitis due to *S. lugdunensis*, 7 months apart, in a man who was on chronic dialysis treatments through a tunneled vascular indwelling catheter.

**Case Report**

A 72-year-old gentleman presented with worsening low back pain of several weeks’ duration. The pain was worse when sitting in the chair or walking but better when lying in bed. At 64 years of age, due to radicular pain caused by large disc herniation between lumbar vertebrae L2 and L3, a laminectomy and microdiscectomy were performed. For the past 12 months, he had been receiving hemodialysis due to the end-stage kidney disease caused by diabetic nephropathy. The dialysis access was a tunneled long-term indwelling catheter (Perm cath™ Minneapolis, MN) that was placed and remained in place for the past 12 months. He did not have a febrile illness or diaphoresis at night time; he was tolerating hemodialysis treatments without complaints of rigors or shivering. Laboratory work up showed white blood cell count of 11,100/mm³ with neutrophils of 85%, lymphocytes of 11%, and eosinophils of 0%. Erythrocyte sedimentation rate was 120 mm/hour, and C-reactive protein was 12 mg/L. Blood cultures from the periphery and the hemodialysis access (tunneled catheter) were continuously positive for *S. lugdunensis*.

The patient was 89 years of age with a history of chronic low back pain. Besides chronic kidney failure and need for hemodialysis, he had no other history of immunosuppression. He did not have fever or leukocytosis; however, the erythrocyte sedimentation rate was elevated, and repeated blood cultures from the periphery and the hemodialysis access (tunneled catheter) were continuously positive for *S. lugdunensis*. The diagnosis was made by bone biopsy and culture. The bacteremia cleared after removing of the dialysis catheter. The patient received 8 weeks of antibiotic therapy for the osteomyelitis.

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cell count (WBC) of 7.200/µL, erythrocyte sedimentation rate (ESR) of 130 mm/h, and C-reactive protein (CRP) of 159 mg/L. The hemoglobin A1c was 5.6%. Daily peripheral blood cultures showed continuous bacteremia for 5 days with \textit{S. lugdunensis}. Sequential cultures from the dialysis catheter were also continuously growing \textit{S. lugdunensis}. A trans-esophageal echocardiogram did not reveal valvular vegetations. A computed tomography demonstrated bony destructive changes of the adjacent endplates at L4-5 levels [Figure 1a]. Magnetic resonance imaging (MRI) of the lumbar spine showed extensive heterogeneous low T1 signal and increased short-tau inversion recovery/T2 signal of the endplates of L4-L5 vertebrae; also, an increased T2 signal of the intervening disc was noted [Figure 1b]. These findings were suggestive of discitis and osteomyelitis. A bone culture of the L4 inferior vertebral endplate also revealed \textit{S. lugdunensis}. Urine culture also showed the same organism as well as pyuria of 64 WBCs per high-power field. The minimum inhibitory concentration (MIC) to oxacillin was $\leq 0.25$ µg/mL. The \textit{mec}A gene DNA by the real-time polymerase chain reaction was not detected. Seven months prior to current presentation, our patient was hospitalized in another institution for acute back pain. Review of patient’s medical record revealed no recorded fever. The ESR was elevated at 117 mm/h, and the WBC was 6400/µL. He underwent a radiographically guided aspiration of the L2-3 vertebral disc space due to high-fluid intensity seen on lumbar MRI. The culture grew \textit{S. lugdunensis} with MIC to oxacillin being $\leq 0.25$ µg/mL. No peripheral or catheter blood cultures were obtained. The patient completed a 6-week cefazolin course received on hemodialysis days. We started antibiotic therapy with nafcillin at 2 gram every 4 h. The catheter was removed and a new long-term dialysis access was placed 3 weeks on nafcillin therapy with documented negative blood cultures. The antibiotic therapy was changed for simplicity to cefazolin on hemodialysis days. The patient completed 8 weeks of total antibiotic therapy. At end of antibiotic therapy, the ESR had decreased to 37 mm/h, and the CRP was negative.

**DISCUSSION**

Our case, as depicted in the literature, highlights the pathogenic potential of \textit{S. lugdunensis}. The circumstances in our patient are interesting as he had evidence of lumbar osteomyelitis in two different locations of the lumbar spine, L2-L3 disc space initially and 7 months later at the L4 vertebral body. Böcher et al. reported recurrent infections due to \textit{S. lugdunensis} in seven patients, one of whom had a recurrent dialysis catheter infection.\cite{10} A recurrent exit-site infection of a peritoneal dialysis catheter necessitating its removal had been reported.\cite{9} \textit{S. lugdunensis} possesses the ability to attach and form biofilms on prosthetic material, thus, shielding against antibiotics and the host’s immune system.\cite{10} We hypothesize that \textit{S. lugdunensis} colonized our patient’s tunneled dialysis catheter which in time led to continued bacteremia and likely seeding to the vertebral bones. In the case of our patient, the catheter was not removed during the first occurrence of osteomyelitis. We theorize that blood cultures were not obtained as he did not have a febrile Illness or elevated WBC. Douiri et al. reviewed bone and joint infections due to \textit{S. lugdunensis} and observed that most of their patients did not present with fever or neutrophilic leukocytosis.\cite{11} However, we cannot explain why our patient did not have fever with bacteremia; nevertheless, bacteremia with \textit{S. lugdunensis} without a febrile response has been reported. Fadel et al., in their review, showed 77% of \textit{S. lugdunensis} bacteremia had a fever.\cite{12} \textit{S. lugdunensis}, contrary to other coagulase-negative Staphylococci, remains sensitive to beta-lactam antimicrobials. Beta-lactamase production is possible, and methicillin resistance is rare with only some strains having the \textit{mec}A gene associated with methicillin resistance.\cite{2}

**CONCLUSION**

\textit{S. lugdunensis} has emerged as an important culprit for infections associated not only with skin/soft tissue and other body sites, but also with bioprosthetic materials, including dialysis catheters. This organism can create a biofilm, thus, necessitating the removal of the hardware to achieve eradication of the infection. Our patient presented with recurrent vertebral osteomyelitis without having a febrile illness and despite having a dialysis-catheter associated bacteremia with \textit{S. lugdunensis}. It is theoretically likely the organism had colonized the dialysis catheter which caused the bacteremia spreading the infection to a different part of the lumbar spine, only to be recognized when blood cultures were obtained from the catheter. This case illustrates the significance of being mindful of the ability of \textit{S. lugdunensis} to adhere to bioprosthetic material and its risk for repeated bouts of infection if not suspected and recognized.

The authors of this manuscript declare that this scientific work complies with reporting quality, formatting and reproducibility guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to not require the Institutional Review Board/Ethics Committee.
review, and the corresponding protocol/approval number not applicable. We also certify that we have not plagiarized the contents in this submission and have done a Plagiarism Check.

**Declaration of patient consent**
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**
There are no conflicts of interest.

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