



Case Reports

Automatic Implantable Cardioverter Defibrillator Lead-related Endocarditis due to *Staphylococcus lugdunensis*

Geethika Thota, MD¹, Betsy Joseph, MD¹, Monarch Shah, MD¹, Henry Redel, MD², Karthik R. Yeruva, MD³, Keval Patel, MD⁴

¹ Department of Internal Medicine, Saint Peter's University Hospital, New Brunswick, NJ, USA, ² Department of Internal Medicine, Division of Infectious Disease, Saint Peter's University Hospital, New Brunswick, NJ, USA, ³ Department of Internal Medicine, Merit Health River Region Hospital, Vicksburg, MS, USA, ⁴ Department of Internal Medicine, Division of Cardiology, Saint Peter's University Hospital, New Brunswick, NJ, USA

Keywords: AICD, biofilm, pacemaker, bacteremia, prosthetic valve, implant, infective endocarditis, coagulase negative Staphylococci, *Staphylococcus lugdunensis*, automatic implanted cardioverter defibrillator

<https://doi.org/10.56305/001c.73883>

Vol. 2, Issue 2, 2023

Staphylococcus lugdunensis is a coagulase-negative staphylococcus (CoNS) that constitutes normal skin flora and is often read as a contaminant when isolated in blood cultures. In recent years *S. lugdunensis* has been increasingly recognized as a true pathogen causing a spectrum of infections from benign skin and soft tissue infections to bacteremia, bone and joint infections, and endocarditis. A significant role in the pathogenesis of infections is played by the ability of the organism to form biofilms that allow it to attach itself to foreign objects such as pacemakers, prosthetic valves, and orthopedic implants. The mortality rate in infective endocarditis caused by *S. lugdunensis* has been as high as 38.8% making it as virulent as *Staphylococcus aureus* reported in the literature. It requires aggressive antibiotics and optimal source control, including surgical debridement and valve replacement if indicated. We present a case of *S. lugdunensis* infective endocarditis in a patient with an automatic implantable cardioverter defibrillator (AICD). The patient presented with lower back pain for three weeks and was found to have a right psoas abscess and *S. lugdunensis* bacteremia, with a vegetation on the right ventricular defibrillator wire requiring device explantation and prolonged antibiotic treatment.

BACKGROUND

Staphylococcus lugdunensis is a coagulase-negative staphylococcus (CoNS) that constitutes normal skin flora and is often read as a contaminant when isolated in blood cultures. In recent years, *S. lugdunensis* has been increasingly recognized as a true pathogen causing a spectrum of infections, from benign skin and soft tissue infections to bacteremia, bone and joint infections, and endocarditis. A significant role in the pathogenesis of infections is played by the ability of the organism to form biofilms that allow it to attach itself to foreign objects such as pacemakers, prosthetic valves, and orthopedic implants. The mortality rate in infective endocarditis caused by *S. lugdunensis* has been as high as 38.8% making it as virulent as *Staphylococcus aureus*.¹ It requires timely antibiotic therapy and source control, including surgical debridement and valve replacement if indicated.

CASE PRESENTATION

A 63-year-old man was seen in the emergency department with complaints of low back pain for three weeks. He had a medical history significant for coronary artery disease with a coronary artery bypass grafting done in 2013, a drug-eluting stent placed in 2020, paroxysmal atrial fibrillation, and

a history of heart failure with reduced ejection fraction secondary to ischemic cardiomyopathy. His most recent ejection fraction (EF) was 10-15%, and he underwent a Medtronic automatic implantable cardioverter defibrillator (AICD) placement in 2014. He reported that the pain started in the lower lumbar region, radiating down the back of the right leg. He denied having fever, chills, or night sweats. He had no trauma, fall, or history of intravenous drug abuse.

His vitals on admission included a temperature of 98.6 F, heart rate of 84 beats per minute, blood pressure of 122/82 mm Hg, respiratory rate of 16/minute, and oxygen saturation of 97% on ambient air. Physical examination showed no point tenderness in the spine but a positive right psoas sign indicating irritation to the iliopsoas group of hip flexor muscles. Laboratory investigations on presentation showed a hemoglobin of 12.3 g/dl (13-17 g/dl), white blood cells $10.7 \times 10^3/\text{mm}^3$ ($4-11 \times 10^3/\text{mm}^3$), platelets $298 \times 10^3/\text{mm}^3$ ($150-400 \times 10^3/\text{mm}^3$), Erythrocyte Sedimentation Rate 90 mm/hr (0-15 mm/hr), C Reactive Protein 190.7 mg/l (0-5 mg/l). Electrocardiogram (EKG) (Figure 1) showed nonspecific ST segment changes in the anterior leads and T wave inversions in the anterolateral leads.

Due to the incompatibility of the AICD with the magnetic resonance imaging machine, a computed tomography (CT) of the lumbar spine was done (Figure 2), which

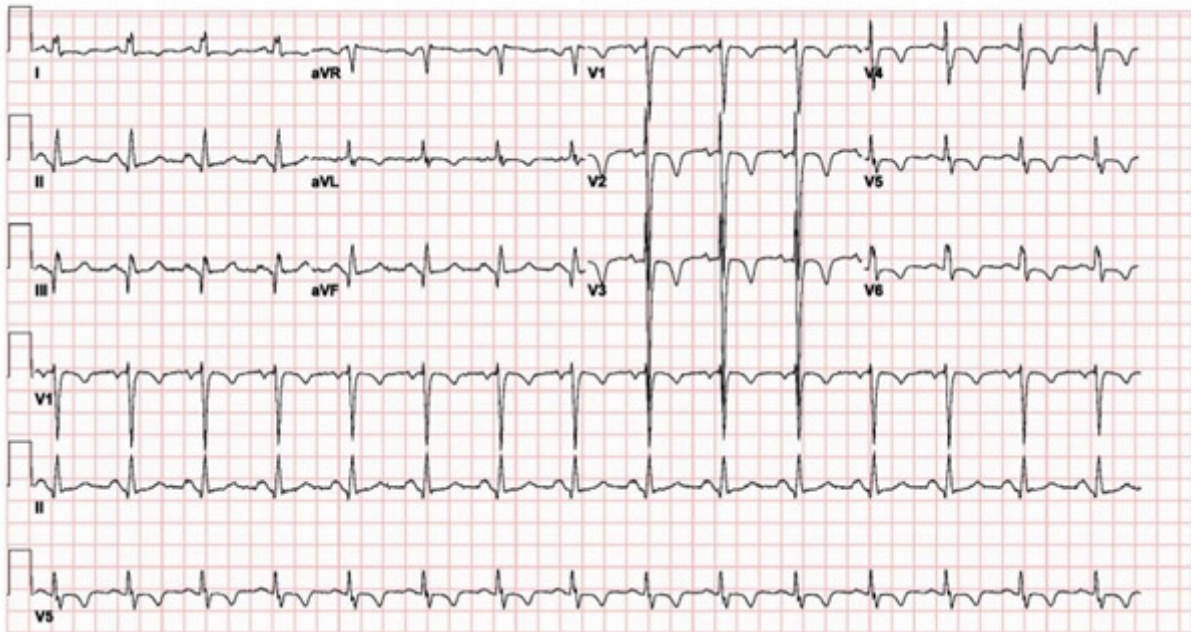


Figure 1. EKG showing T wave inversions in leads V1-V6, I and aVL.

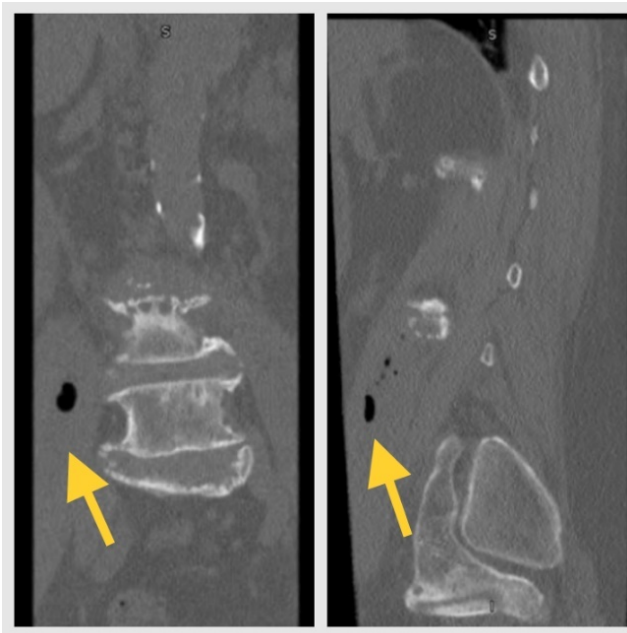


Figure 2. CT lumbar spine without contrast coronal view showing small amounts of fluid and air within the right psoas muscle (yellow arrows).

showed a small collection within the right psoas muscle suggestive of an abscess.

A transthoracic echocardiogram showed an ejection fraction of 25% with the pacemaker in place with no evidence of vegetation. A transesophageal echocardiogram showed a mobile echo density on the right ventricular defibrillator wire consistent with vegetation. Blood cultures grew *Staphylococcus lugdunensis*, which was isolated from repeat blood cultures as well. Culture and antibiotic sensitivity analysis revealed that the organism was sensitive

to vancomycin, clindamycin, oxacillin, erythromycin, tetracycline, ciprofloxacin but resistant to benzylpenicillin. The patient was transferred to a tertiary medical facility and eventually underwent an explantation of the AICD. He received a total duration of 10 weeks of antibiotics with intravenous vancomycin. A repeat echocardiogram was negative for vegetation and repeat blood cultures were sterile.

DISCUSSION

Coagulase-negative *Staphylococci* (CoNS) are usually non-pathogenic commensals, and in an individual with a normal immune response, CoNS infective endocarditis is uncommon.¹⁻³ *Staphylococcus lugdunensis* are gram-positive cocci that are catalase-positive, coagulase-negative, and novobiocin susceptible, often displaying hemolysis on blood agar.^{1,4} The colonies appear unpigmented with an opaque white appearance at 24 hours of incubation. At 48 to 72 hours of incubation, they appear pale yellow and have a hay-like odor akin to a screw pine leaf.^{1,2,4,5} The ability to produce ornithine decarboxylase, pyrrolidonyl arylamidase, and fibrinogen affinity factor helps differentiate *S. lugdunensis* from other CoNS species. Laboratories may also utilize a rapid slide latex agglutination test to identify the organism.^{4,5}

S. lugdunensis endocarditis has been reported in association with high mortality. However, with appropriate intervention, current evidence suggests that the prognosis for *S. lugdunensis* endocarditis has improved.^{1,4-6} Among 20 cases of *S. lugdunensis* endocarditis reported up to 1993, the mortality rate was 70%, whereas, among 28 cases reported after 1993, mortality decreased to 18%.^{7,8} Mortality observed for the latter cases is more consistent with the mortality associated with coagulase-negative staphylococcal native valve endocarditis.⁷⁻⁹ In the last decade, cases

of *S. lugdunensis* from Europe, China, and the United States have been reported. Despite low incidence because of its high virulence, *S. lugdunensis* requires immediate and aggressive treatment, including surgical intervention to achieve source control. The reduction in mortality rates is probably secondary to earlier diagnosis and a higher rate of surgical intervention for cases after 1993 than cases before due to the speciation of coagulase-negative staphylococci.^{1,4,8-10}

Very few cases of endocarditis have been reported with the association of *S. lugdunensis*.^{1,2,10} In a review of nine cases of *S. lugdunensis* prosthetic valve endocarditis, the mortality rate reported was 78%, and the rate of complications was periannular abscess (66%), embolization leading to stroke (11%), and heart failure (22%).⁹ The natural history of *S. lugdunensis* prosthetic valve endocarditis ranged from six months to up to 13 years.^{1,3,5,10,11}

This report discusses infective endocarditis associated with AICD and *S. lugdunensis*. The AICD was placed seven years prior to presentation in our patient. In previous case reports of *S. lugdunensis* AICD endocarditis, patients were managed with hardware removal and antibiotic therapy.^{1,6,8,10} Small colony variants of *S. lugdunensis* have been reported in the setting of pacemaker retention and persistent infection.^{1,7,12} Our case highlights the importance of speciation of CoNS, early detection of *S. lugdunensis*, and eventual source control with explantation of the pacemaker.

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DISCLOSURES/CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

FUNDING STATEMENT

No funding was obtained for this manuscript.

AUTHOR CONTRIBUTION

All Authors (GT, BJ, MS, HR, KY, KP) have reviewed the final manuscript prior to submission. All the authors have contributed significantly to the manuscript, per the ICJME criteria of authorship.

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CORRESPONDING AUTHOR

Geethika Thota
254 Easton Avenue,
Saint Peters University Hospital,
New Jersey, NJ-08901
Email: prathima.thota95@gmail.com
ORCID: 0000-0003-0438-8498

Submitted: December 10, 2022 EDT, Accepted: March 24, 2023 EDT



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