

Gemella haemolysans: Rare case of automatic implantable cardioverter-defibrillator (AICD) lead infection

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Abstract

We present a rare case of *Gemella haemolysans* automated implantable cardioverter defibrillator (AICD) lead infection. *Gemella* species are catalase-negative, facultative anaerobic, Gram-positive cocci which are found in normal human oral flora. *Gemella* are often incorrectly identified on routine Gram stain and culture, requiring advanced techniques such as PCR. *Gemella* has been shown to be a rare cause infective endocarditis in case reports; however, there has not been a report of an isolated AICD lead infection. AICD infections with gram positive organisms other than *Staphylococcus* species has been associated with more aggressive infections and higher mortality. Standard treatment for *Gemella* consists of β -lactam inhibitors and aminoglycosides. In this case, we present an alternative antibiotic treatment with vancomycin and ceftriaxone. A case series for *Gemella haemolysans* endocarditis, without lead infection, reported the use of vancomycin and ceftriaxone with good results. This approach is similar to methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia salvage therapy. In addition, this case highlights the importance of culture and sensitivity in the selection of antibiotics, particularly avoiding nephrotoxic drugs when possible.

Keywords

Gemella haemolysans, AICD lead infection, ceftriaxone, vancomycin, CKD

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Introduction

Implantable cardiac devices such as, pacemakers, implantable cardioverter defibrillators, and cardiac resynchronization devices are routinely used to prevent cardiac death from arrhythmias.¹ Device and lead infections continue to increase due to an expansion in devices implanted and increasing patient co-morbidities.¹ While *Staphylococcus aureus* is the most prevalent organism, the highest rate of mortality was found in patients with Gram-positive infections caused by non-staphylococcus organisms.² Due to this association, it is important to document and understand rare causes of implantable cardiac devices and their treatment.

Gemella are opportunistic Gram-positive non-staphylococcus pathogens found in the normal flora of the digestive tract of humans that have been identified as the cause of severe infections.^{3,4} Risk factors for infection include poor dental hygiene, underlying heart disease, intravenous drug use and gastrointestinal procedures.^{5,6} We report a case of *Gemella* automated implantable cardioverter defibrillator

(AICD) lead infection. Several case reports describe infective endocarditis from *Gemella*.^{7,8} To our knowledge, this is the first *Gemella* AICD lead infection to be documented without endocarditis treated with the combination of ceftriaxone and vancomycin.

Case report

A 65-year-old male presented with hypotension, leukocytosis, and acute renal failure and reported 3 to 4 weeks of intermittent fever, rigors, and diarrhea. Physical exam was

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notable for a Grade III holosystolic murmur heard best at the right upper sternal border. His history was significant for ischemic cardiomyopathy status post-AICD placement, history of successful treatment of aortic valve endocarditis, porcine aortic valve replacement, and chronic kidney disease stage 3a. Of note, patient cracked a molar tooth two months prior to presentation without subsequent dental care.

Blood cultures obtained prior to initiation of antibiotics grew *Gemella sanguinis*, as identified by VITEK, on hospital day 3. Further testing of initial positive blood cultures via MALDITOF (Matrix-assisted laser desorption/ionization time of flight) identified species as *G. haemolysans*, not *G. sanguinis*. Transesophageal echocardiogram (TEE) obtained on hospital day 4 was negative for valvular vegetation as seen in Figure 1; however, it showed fibrinous attachments on the right ventricular and atrial AICD leads as shown in Figures 2 and 3, as well as globular material with independent motion, and was diagnostic for an AICD lead infection.

The patient was treated with intravenous vancomycin and ceftriaxone while awaiting device removal, accomplished 49 days after presentation, and then continued for 2 weeks post AICD removal. Surveillance blood cultures remained negative after antibiotic completion.

Discussion

Gemella species are catalase-negative, facultative anaerobic, Gram-positive cocci, which are found in normal human oral flora.⁸ *Gemella haemolysans* was first described in 1938 as a nisseria spp. But later identified via electron microscopy as Gram positive organism and a new species, *Gemella*, was created in 1960.⁶ On review of 80 cases of infective endocarditis by Ramanathan et al.⁸ found around one third of patients with *Gemella* infective endocarditis were negative by blood culture, but positive by PCR. In addition, current reported case studies identify left sided endocarditis as the most common site of infection with a preference toward valvular disease and prosthetic valves.⁷⁻⁹ The most common source of infection from *Gemella* is poor dental hygiene followed by underlying heart disease, intravenous drug use and gastrointestinal procedures.^{5,10}

Cardiac implantable electronic devices such as, cardiac pacemaker (CP), implantable cardioverter defibrillators (ICD), and cardiac resynchronization (CRT) are routinely used for treatment for arrhythmias to prevent sudden cardiac death.¹ The burden of lead infection from 2004 to 2008 increased from 1.53% to 2.41% due to increase in devices implanted and patient co-morbidities.¹ AICD infection risk is 1.7% in the first 6 months and 9.5% within the first 2 years.¹ The diagnosis of device infection was accomplished by modified DUKE criteria, meeting two major criteria (i) ≥ 2 positive blood cultures greater than 12 hours apart and (ii) oscillating intracardiac mass on implanted material without alternative anatomical explanation per AHA guidelines.¹¹ The most prevalent organism is *Staphylococcus aureus* with

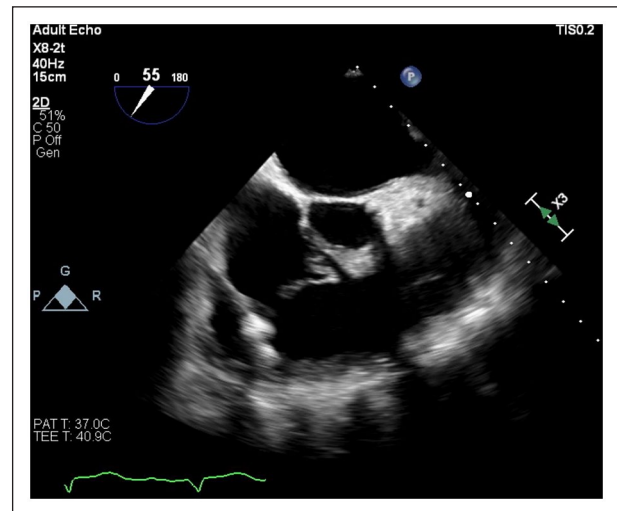


Figure 1. TEE of tricuspid valve with no evidence of vegetations.

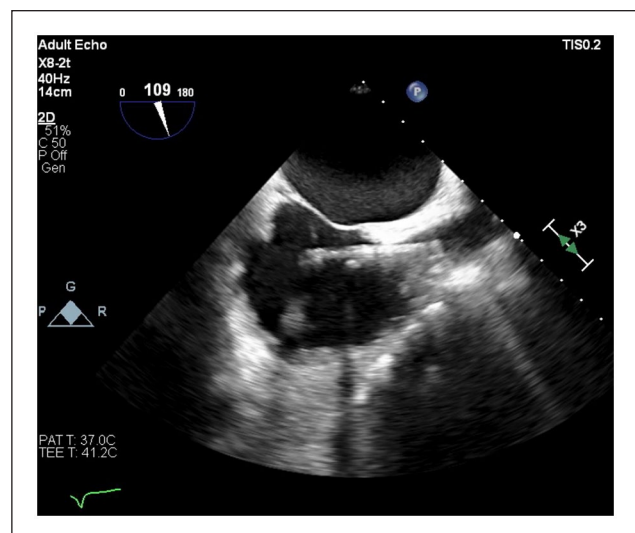


Figure 2. TEE with fibrinous attachments to the AICD lead in the superior vena cava.

localized infections to the implantation pocket accounting for the majority of postoperative infections.¹ Infections complicated by lead vegetations require 2 to 4 weeks of antibiotics in addition to lead and device extraction.^{1,11} While roughly one third of patients will no longer require a cardiac implantable device, recent studies have shown that leadless pacemakers may be implanted safely during active infection.^{1,12} Mortality for AICD infection vs patients without infection at 3-year follow-up was recently reported to be 47.7% and 31.6%, respectively.² In addition the highest rate of mortality was found in patients with gram positive infections caused by non-staphylococcus organisms.² While *Gemella* was not specifically addressed, it is a Gram-positive species other than staphylococcus with limited data on treatment and needs to be studied to determine its mortality.

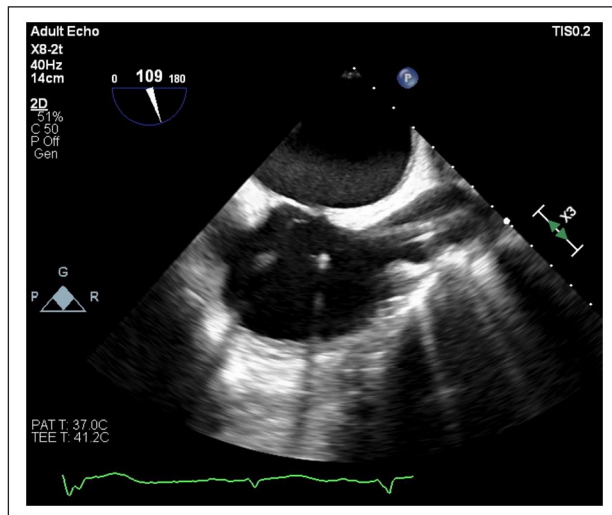


Figure 3. TEE with fibrinous attachments seen fluttering during study in the right atrium.

Given the absence of data concerning lead infection by this organism and inability to do susceptibility testing at our facility, our treatment course was derived from case reports and guidelines on infective endocarditis in addition to cardiac device removal. Per the American Heart Association, the recommendation for treatment of *Gemella* associated native valve endocarditis, consists of penicillin G or Ceftriaxone paired with Gentamicin.^{11,13} Susceptibility testing on *Gemella* species was performed in 1982, finding that penicillin G was effective monotherapy, however when combined with aminoglycosides a synergistic effect was observed.¹³ The limitation of this work is that dual therapy was only performed with aminoglycosides despite finding *Gemella* species studied were pan sensitive.¹³ To our knowledge, there have been no follow-up in vitro studies on *Gemella haemolysans* antibiotic sensitivity. However, there is a paucity of data regarding the necessity of aminoglycoside therapy for *Gemella haemolysans* AICD infection. A case series from the Cleveland Clinic reported favorable outcomes in six patients with *Gemella Haemolysans* infective endocarditis, not lead infection, who were treated with vancomycin and ceftriaxone.⁸ For our patient with CKD IIIa, aminoglycoside nephrotoxicity had the potential to worsen his renal function, therefore dual therapy with parenteral ceftriaxone and vancomycin were chosen based on literature review with renal protection in mind.^{13–15} The approach of synergism is similar to MRSA bacteremia salvage therapy after failure of vancomycin monotherapy.¹⁵ MRSA salvage therapy consists of dual therapy such as vancomycin plus β -lactam, or Daptomycin with Ceftaroline.¹⁵ Our patient responded successfully to dual therapy with vancomycin and ceftriaxone as confirmed on the negative surveillance cultures and without acute renal injury. More studies should be done regarding this pathogen, but in the meantime the less nephrotoxic combination of ceftriaxone and vancomycin may be considered a satisfactory treatment.

Conclusion

Gemella haemolysans is a rare isolated species in infective endocarditis, but our case represents one of the first reported cases of an AICD lead infection by *Gemella haemolysans* in absence of infective endocarditis. Non-staphylococci species, such as *Gemella haemolysans*, have been shown to have more aggressive disease course and have decreased survival rates. Traditional treatment for *Gemella haemolysans* endocarditis has consisted of β -lactam and aminoglycosides. Alternative therapies, similar to MRSA bacteremia salvage therapy, present reasonable alternatives to traditional *Gemella* treatment. This approach in patients with co-morbid conditions, such as renal disease, highlights the importance of alternative anti-microbial therapies.

Declaration of conflicting interests

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article. We have obtained written informed consent from patient's wife as the patient passed away prior to written consent being obtained. We have a record at our institution of her written consent.

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