Journal of Community Hospital Internal Medicine Perspectives

Volume 14 | Issue 2 Article 15

2024

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CASE REPORT

Streptococcus canis Native Aortic Valve Endocarditis Linked to Cat Exposure: A Case Report and Review

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Abstract

***Streptococcus canis* is an uncommon human pathogen, but documented infections have been mostly associated with exposure to dogs. There are only five documented cases of endocarditis secondary to *streptococcus canis*, with all cases except one documenting exposure to a canine. We present a 74-year-old male with a history of Type 2 diabetes mellitus, CKD 3, moderate aortic stenosis and remote exposure to agent orange, who was found to have *Streptococcus canis* native valve endocarditis without exposure to a dog. To the best of our knowledge this case is the first case of endocarditis linked to feline exposure.**

Keywords: *Streptococcus canis*, Native valve, Aortic valve endocarditis, Cat exposure

1. Introduction

Streptococcus canis is a beta-hemolytic streptococcus species, classified as Lancefeld Class G.[1,2] It has previously been identified in animals, most prominently in dogs,[3-6] but has also been documented in cats.[7-11] *Streptococcus canis* has been shown to cause disease in humans as well.[2] Specific infections include soft tissue infections,[2] bacteremia,[12-15] urinary tract infection,[2] osteomyelitis,[2] and pneumonia.[2]

Streptococcus canis is a rare cause of endocarditis. There are only five documented cases of endocarditis secondary to *streptococcus canis*, with all except one documenting exposure to dogs.[16-20] The actual number of cases may be higher due to changes in Lancefeld classification.[6,21] To the best of our knowledge, this is the first documented case of *streptococcus canis* endocarditis linked to feline exposure.

2. Case

A 74-year-old male with a past medical history of Type 2 diabetes mellitus, agent orange exposure, prior calcaneal osteomyelitis, CKD3a, CHF, and moderate aortic stenosis presented with lightheadedness and dizziness. Patient was transported to the hospital via ambulance and found to be hypotensive, which was confirmed in the emergency room. Blood pressure was 69/43, heart rate 101,and temperature 36.5 °C. He denied any other significant symptoms, including dyspnea, urinary symptoms, or gastrointestinal symptoms. On physical examination, cardiovascular exam revealed sinus rhythm with mild tachycardia and no murmurs, lung exam revealed wheezing, right lower extremity exam demonstrated venous statis dermatitis with erythema.

His initial workup (Table 1) revealed White blood cell (WBC) 24.7 cells^3/μL, acute kidney injury (creatinine 2.1 mg/dL, baseline 1.2 mg/dL), elevated lactate (4.1 mmol/L) and elevated C-Reactive Protein (14.8 mg/dL), and elevated Procalcitonin 30.75 ng/mL (normal <0.09). He required aggressive fluid resuscitation, pressor support with norepinephrine, and ICU admission. The initial source of sepsis was unclear, and he was started empirically on meropenem 1 g every 12 h and a single dose of vancomycin 2 g. Blood cultures were positive for

Received 31 August 2023; revised 21 December 2023; accepted 5 January 2024.
Available online 4 March 2024

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https://doi.org/10.55729/2000-9666.1318

Table 1. Pertinent labs.

Lab	Results
WBC	24.7 cells^3/uL (3.6–12.7)
Creatinine	2.1 mg/dL (0.7–1.2)
Lactate	4.1 mmol/L (0.5–2.2)
CRP	14.8 mg/dL (<0.5)
Procalcitonin	30.75 ng/mL (<0.09)
Blood cultures	*Streptococcus canis* x 2 sets
Susceptibility	Ampicillin, cefotaxime

Streptococcus canis, which was diagnosed via MALDI-TOF (matrix assisted laser desorption ionization-time of flight mass spectrometry). Further history revealed a dental bridge extraction. He had no exposure to dogs, but did admit to exposure to cats, who licked but did not bite him. Due to the streptococcus bacteremia, a transesophageal echocardiogram was performed, which was suggestive of a 5 × 8 mm aortic valve vegetation (Fig. 1) and severe aortic stenosis. Due to his history of heel ulcers and calcaneal osteomyelitis, MRIs of the right and left feet were performed but found no evidence of recurrent osteomyelitis.

After 48 h, he was transitioned to intravenous ceftriaxone 2 gm daily to complete 6 weeks of therapy. A telephone encounter confirmed resolution of symptoms at the end of his course, as patient's care was out of system. Subsequent blood cultures 6 months later were negative. Unfortunately, he was diagnosed with esophageal cancer at that time, and died one month after diagnosis.

3. Discussion

Streptococcus canis has been known to cause disease in dogs[3-6,8] and cats.[3,7-11] The first human case was noted to cause bacteremia in a 77-year-old patient with a dog and multiple skin ulcers.[12] Previous outbreaks in cats and dogs have reported both respiratory infections and cutaneous infections.[7,11]

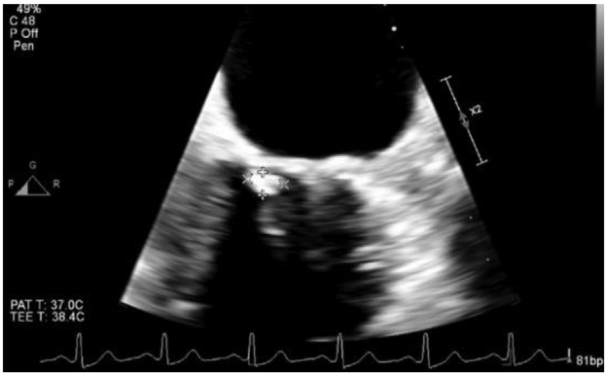

Fig. 1. Aortic valve vegetation.

Streptococcus canis has been demonstrated to colonize the upper airway and part of animals' microbiome,[4,6-8,11] suggesting that the oral cavity and skin are important factors in transmission. Several patients with *streptococcus canis* bacteremia were reported to have either noted to have bite wounds[13,15] or superficial ulcers.[12-14,21] In addition, one series reported 64.8 % of *streptococcus canis* cases to have cutaneous infections.[2] We believe our patient's source was likely his right leg cellulitis.

Among patients with bacteremia, the majority were age >62 years and had dog exposure.[12-15,21,22] One series examined 54 cases at a single institution, with common manifestations including soft tissue infections, bacteremia[2] urinary tract infection,[2] septic knee arthritis,[2] osteomyelitis,[2] and nosocomial pneumonia.[2] Patients often had underlying conditions, including cardiovascular disease in 53.7 %, malignancy in 24 %, and diabetes mellitus in 16.7 %.[2]

To our knowledge, there have only been five previously reported cases of endocarditis with *streptococcus canis*.[16-20] All five were published as case reports[16-20] in English speaking journals. In terms of age, all five patients were elderly, ranging from ages 65 to 85[16-20] (Table 2). In terms of dog exposure, four of the five had known exposure to dogs.[16-18,20] The fifth case did not describe the presence or absence of dog exposure.[19] To the best of our knowledge, our patient is the first case of endocarditis associated with cat exposure. In terms of underlying co-morbidities, three patients had chronic lower extremity edema,[16,17,19] two patients had a prior malignancy,[16,18] one with alcoholism,[17] congestive heart failure,[17] atrial fibrillation,[17] diabetes mellitus,[17] cirrhosis,[17] one with a prosthetic aortic valve,[19] and one with a Chiari malformation.[20]

In terms of clinical presentation, four patients presented with documented fevers,[16,18-20] with the other patient (#3) presenting with hypothermia.[17] Interestingly, our case patient (#6) was normothermic. Three of the patients presented with dyspnea (#1, #3, #4)[16-18], and four of the six presented with hypotension (#2, #3, #4, #6).[16-18] Two patients (#1, #2) had mitral valve endocarditis resulting in severe mitral regurgitation,[16,18] including one with a 15 mm vegetation and emboli to the kidney, retina, and multiple cerebral abscess, and the other with a 22 mm vegetation. Patient #3 had a 17 mm mass attached to the ventricular side of the aortic valve. Patient #4 had a bioprosthetic aortic valve and was found to have prosthetic valve endocarditis, an aorto-right atrial fistula, complete heart block, and annular abscess. Patient #5, who had a Chiari malformation, was found to have a right atrial mass.[20]

Table 2. Cases of streptococcus canis endocarditis.

	Age/gender	Underlying health conditions	Presenting symptoms	Dog	Echo finding	Culture	Treatment
1	65/F	Uterine carcinoma in remission	Fever, hypotension, confusion	Yes no wounds, gardens	Sev MR 15 mm veg	+ for Group G strep, identified via MALDI, S to PEN, low level resistance to gentamicin	IV amoxicillin 200 mg/kg/day x 6 weeks, IV gentamicin 3 mg/kg/day x 2 weeks, Valve replacement
2	73/F	HTN, HL, coxarthrosis, ovarian cancer	Fever, left sided heart failure	Yes, no bite	Sev MR, large calcification in the mitral annulus, 22 × 14 mm	blood cx + for beta hemolytic strep, API 20Strep,	− IV penicillin 5 million units 4x/day x 6 weeks, Valve replacement
3	71/M	Dilated cardiomyopathy, EtOH cirrhosis, atrial fib, DM, venous insufficiency	Hypothermia, fa tigue, hypotension, confusion, respira tory failure	Yes − dog licked ulcers	17 mm mass, grade 1 AI,	group G strep on blood cx − dx with MALDI-TOPF and genomic sequncing Amoxicillin, low level gentamicin resistance	IV amoxicillin 200 mg/kg/day (6 doses/day) x 2 weeks followed by 3 weeks of oral amoxicillin
4	82/F	Severe aortic stenosis s/p prosthetic valve	Fever, exertional dyspnea, shock, AV Block	Unknown	prosthetic valve vegetation and annular abscess, as well as non-coronary cusp to right atrial fistula	Negative blood culture, PCR on whole blood and excised valve tissue	IV Penicillin and gentamicin, re-replacement of valve
5	85/F	Cellulitis, Lymphedema, alcohol, prior *streptococcus equismilis*	Fever, rigors, mal aise, bilateral lower extremity edema	Yes, dog licking wounds	R atrial mobile mass, Chiari network	Positive blood culture	Ceftriaxone 2 gm daily x 6 weeks
6	74/M	Severe aortic ste nosis, lymphe dema, agent orange exposure, CKD3, DM	Hypotension, afebrile, cellulitis	Yes, venous stasis	8 mm vegetation, severe aortic stenosis		Ceftriaxone 2 gm daily x 6 weeks

In terms of microbiologic diagnosis, four patients were diagnosed via blood cultures.[16-18,20] Diagnostic methods for species identification -included MALDI-TOF in two patients[17,18] and API20 Strep, a molecular assay, in one patient.[16] The patient with prosthetic valve endocarditis had negative blood cultures, but was diagnosed via Polymerase Chain Reaction (PCR) on blood and excised tissue.[19] As previously mentioned, the number of cases of *streptococcus canis* endocarditis may be underestimated due to the unreliability of Lancefield types in identifying *streptococcus canis*.[6,21]

Typical pathogens for endocarditis include *staphylococcus* aureus, viridans *streptococci*, *streptococcus bovis,* community-acquired *enterococcus*, and HACEK organisms (*Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella, Kingella)*.[23] Although beta-hemolytic *streptococcus* endocarditis is rare, the American Heart Association (AHA) guidelines for endocarditis acknowledge chronic skin disorders as a risk factor for beta hemolytic *streptococcus*.[23] In terms of cat or dog exposure, other potential pathogens included *bartonella, pasteurella, and capnocytophaga*, but *streptococcus canis*[23] was not included. Consideration should be given in future guidelines updates to *streptococcus canis* as a potential pathogen with animal exposure and elderly patients with comorbidities.

Typical risk factors for endocarditis include poor dentition, prolonged vascular access, intravenous drug use, intracardiac devices, prosthetic valves, and other prosthetic material.[24] Other secondary risk factors include chronic kidney disease, liver disease, cancer, human immunodeficiency virus, and advanced age (ages 58–77).[24] In our review, all patients were ≥65 years, and the majority had significant comorbidities.[16-20] In addition, patients with *streptococcus canis* endocarditis frequently had lymphedema or ulcers, providing a portal of entry for the bacteria.[16,17,19] The subsequent bacteremia may disseminate and seed heart valves, resulting in endocarditis. Clinical presentation of endocarditis may be variable,[23] but typical endocarditis symptoms include fever and systemic symptoms.[24] Most patients in this series had either fever and hypothermia and presented with either hypotension or signs and symptoms of heart failure.[16-20]

Mortality from endocarditis overall ranges from 20 to 30 %.[24] Specifically, Group C-Group G *streptococcus* (GCGS) endocarditis, to which *streptococcus canis* belongs, observed had a mortality rate to be 17 %.[25] Specific treatment regimens for endocarditis are dependent on the specific organisms.[23] The AHA guidelines recommend six weeks of intravenous antibiotics for most pathogens, although some *streptococcus* infections may be treated for as short as four weeks.[23] The most common regimens used for GCGS endocarditis included penicillin and ceftriaxone.[25] Similarly, all patients in this series were treated with penicillins or ceftriaxone,[16-20] with one patient on amoxicillin in combination with gentamicin due to the presence of a prosthetic valve.[19] All of the patients in our review of *streptococcus canis* endocarditis demonstrated susceptibility to penicillin.[16-20] One case of endocarditis demonstrated low level resistance to gentamicin.[18] Other *streptococcus canis* infections also demonstrated penicillin susceptibility,[2,12-15,19,22] although there were rare cases of penicillin intermediate strains in one series.[2]

Indications for surgery of native heart valves include heart failure due to valvular dysfunction, highly resistant organisms, fungi, vegetations >10 mm, annular or aortic abscess, or heart block.[23] Two patients underwent mitral valve replacement,[16,18] with a third patient having an indication for aortic valve replacement, but deemed a poor candidate.[17] A patient with an infected prosthetic aortic valve and aorto-right atrial fistula also required a re-replacement, due to an abscess and complete heart block.[19] All patients in this series recovered completely within several months of onset of infection, although one had decreased visual acuity from a retinal embolism.[18]

In summary and to the best of our knowledge, we present the first documented case of *streptococcus canis* bacteremia endocarditis resulting from cat exposure. Consideration should be given to evaluating patients for endocarditis, particularly in patients with existing comorbidities.

Disclaimer

This case was presented at the CHEST conference in 2021 as an oral presentation. Although the abstracts were published in the CHEST journal, it was not Pubmed indexed. In addition, we have performed a more comprehensive literature review.

Source of support

None.

Conflicts of interest

The authors report no conflicts of interest.

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