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Case Study: Abnormal Presentation of Infective Endocarditis With Streptococcus Canis and Chiari Network

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Abstract

Here we present a rare case of infective endocarditis (IE) with *Streptococcus canis* and Chiari network in an 85 year old female living with multiple dogs and open skin of lower extremity predisposing her to bacteremia. Underlying abnormalities of the cardiac chambers such as Chiari network predisposes to a higher incidence of bacterial seeding and causing IE. A Chiari network is usually asymptomatic and of no clinical significance but can worsen prognosis in IE. IE carries a significant morbidity and mortality burden and when diagnosed early can be a lifesaving diagnosis. Due to the wide range of complications, early diagnosis and treatment with targeted antimicrobial therapy and consideration of early surgical intervention are vital to the evaluation and treatment of IE. Though Staphylococci, Streptococci, Enterococci, HACEK organisms amount for the majority of IE, some atypical organisms including group G Streptococci such as *S. canis* have been reported to carry high mortality and hospitalization risk in patients with bacteremia. *S. canis* is a group G beta-hemolytic Streptococci which normally resides on the skin and mucosal surfaces of dogs. This Case Report shines light on the versatility of microorganisms that can cause IE in a patient with underling Chiari network, and the risk of morbidity and mortality with such species highlighting the importance of early diagnosis and treatment.

Keywords

Infective Endocarditis, Streptococcus Canis, Chiari Network

Conflict of Interest Statement

None

CASE REPORT

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Abstract

Here we present a rare case of infective endocarditis (IE) with *Streptococcus canis* and Chiari network in an 85 year old female living with multiple dogs and open skin of lower extremity predisposing her to bacteremia. Underlying abnormalities of the cardiac chambers such as Chiari network predisposes to a higher incidence of bacterial seeding and causing IE. A Chiari network is usually asymptomatic and of no clinical significance but can worsen prognosis in IE. IE carries a significant morbidity and mortality burden and when diagnosed early can be a lifesaving diagnosis. Due to the wide range of complications, early diagnosis and treatment with targeted antimicrobial therapy and consideration of early surgical intervention are vital to the evaluation and treatment of IE. Though Staphylococci, Streptococci, Enterococci, HACEK organisms amount for the majority of IE, some atypical organisms including group G Streptococci such as *S. canis* have been reported to carry high mortality and hospitalization risk in patients with bacteremia. *S. canis* is a group G beta-hemolytic Streptococci which normally resides on the skin and mucosal surfaces of dogs. This Case Report shines light on the versatility of microorganisms that can cause IE in a patient with underling Chiari network, and the risk of morbidity and mortality with such species highlighting the importance of early diagnosis and treatment.

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1. Introduction

Streptococcus canis is a zoonotic pathogen that is transferred mainly from companion animals to humans, most common being cats and dogs. Statistically the infection occurs more often in those with chronic venous stasis ulcerations on legs and typically results in a localized soft tissue infection (65%), bacteremia (9%), urinary infection (6%), bone infections (4%), pneumonia (2%), or are asymptomatic (15%).[1] Classified as a group G beta-hemolytic Streptococci, *S. canis* can be difficult to differentiate and typically mistaken for other group G beta-hemolytic Streptococci. Members of this group include *Streptococcus dysgalactiae* subspecies *equisimilis*, *Streptococcus milleri*, *S. canis*, and *Streptococcus intestinalis.* The first reported and confirmed case of septicemia with *S. canis* was in 1997.[2] Since then, a better awareness of *S. canis* has led to an increasing number of reports and literature about infections however reported cases of infective endocarditis (IE) remain rare. In a retrospective study, *S. canis* was identified as the causative agent of endocarditis less than 1% of the time.[2]

The Chiari network is a vestigial remnant of the right venous valve from fetal life. It runs from the inferior lateral part of the right atrium and extends onto the atrial septum in the region of the lower portion of the limbus of the fossa ovalis.[3] In fetal life, the right venous valve is responsible for redirecting blood flow from the inferior vena cava into the foramen ovale. Chiari network, when present, is a fenestrated and filamentous structure that typically has an undulating appearance in real-time imaging, and can often be mistaken for cardiac mass or emboli.[4] When not fenestrated, it is known as the

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eustachian valve or valve of the inferior vena cava, which is a normal structure found in 70% of autopsies of the heart.[4] Chiari networks may retain their role from fetal life, when they facilitated flow from the inferior vena cava across the patent foramen ovale (PFO). One study found that Chiari network was present in 2%−3% of patients that received a transesophageal echocardiogram (TEE), and typically associated with PFO 83% of the time.[5] This structure can be visualized by transthoracic echocardiogram (TTE) in the four-chamber apical view, but is typically visualized with the use of a TEE.[4]

2. Case presentation

An 85 year old female with past medical history of chronic lymphedema with chronic venous stasis, lichenification of heel skin, daily alcohol use that lives with 5 domestic dogs presented to ED with fevers, chills and generalized weakness. The patient on physical exam was ill-appearing with rigors, had dry mucous membranes, new heart murmur, and bilateral lower extremity edema with venous stasis changes. On admission, she met criteria for systemic inflammatory response syndrome (SIRS) with temperature max 104.4 °F, heart rate 110 bpm. Labs showed leukocytosis WBC 11.9 with neutrophilia and CT abdomen pelvis without significant findings. Two sets of peripheral blood cultures were obtained from two separate insertion sites. She was then empirically started on piperacillin/tazobactam and vancomycin.

Of note, 6 months prior to this presentation, she was hospitalized with Streptococcal bacteremia and was found to have 1 out of 2 blood cultures with *Streptococcus equisimilis.* Due to a negative workup, she was subsequently treated with IV ceftriaxone 2 g daily for 2 weeks and had a negative blood culture at the end of therapy.

During this admission the patient remained febrile T max 101.2 F on broad spectrum antibiotics for the two days, and even started to develop left lower extremity cellulitis. She was transitioned to cefepime 2 g daily from piperacillin/tazobactam. During her hospitalization, 1 out of 2 sets of blood cultures were positive for *Streptococcus cains*, and TEE was positive for Chiari network in the right atrium with probable associated mobile mass. Patient was diagnosed with infective endocarditis based on Duke's Criteria with positive echocardiogram, predisposing heart condition, fever: 38 °C, and 1 positive blood culture. Infectious Disease was consulted and it was presumed that the prior *Streptococcus equismilis* bacteremia was in fact *S. canis* as several studies have shown group G beta-hemolytic Streptococci can often be misidentified as their counterparts.[6] The source of *S. canis* infection was connoted to her venous stasis, chronic lymphedema with superimposed cellulitis, and recurrent introduction from her pet dogs' licking her wounds. Her IE was likely secondary to an already predisposed risk factor of congenital cardiac anomaly secondary to Chiari network. She was transitioned to IV ceftriaxone 2 g daily and discharged with 6 weeks total of therapy. After completion, she was put on oral amoxicillin until repeat TTE, which was found to be within normal. Antibiotics were stopped after repeat blood cultures were negative.

3. Discussion

S. canis normally resides on the skin and mucosal surfaces of dogs but can also be isolated from cats, mice, rabbits, and cattle.[7] Those with exposure should be considered higher risk for *S. canis* infection. Zoonotic species such as *S. canis* rarely cause IE, however the chance further increases with risk factors such as advanced age, diabetes mellitus, injection drug use, chronic steroids, cardiac transplantation with valvopathy, an implanted cardiovascular device, and congenital heart disease.[8] Optimizing these factors by tighter management of diabetes, early screening for congenital heart disease and yearly echocardiogram in patients with valve transplants can all be presumed ways to help morbidity. IE carries in-hospital mortality around 20%.[9] Whereas, group G Streptococcal bacteremia has been associated with high mortality, up to 83% in one study.[10] Therefore, prompt recognition and aggressive treatment of group G Streptococcal bacteremia can be lifesaving, especially in patients with cardiac abnormalities.

Underlying abnormalities of the cardiac chambers such as Chiari network predisposes to a higher incidence of bacterial seeding and causing IE. A Chiari network is usually asymptomatic and of no clinical significance, therefore patients live a normal life until developing other cardiac disease which then worsens overall prognosis.[8] This filamentous structure in the right atrium has been associated with valvular endocarditis.[11] A Chiari network can rarely facilitate an ongoing embryonic right atrial flow pattern in adulthood by directing blood flow from inferior vena cava to interatrial septum. This favors the ongoing presence of a PFO and atrial septal abnormality causing paradoxical embolism.[8] To prevent such complications, early diagnosis and treatment is vital.

Treatment of IE involves the use of intravenous antibiotics and valve surgery, if indicated.[12] This filamentous network can predispose to persistent infection and thrombus formation, thus valve surgery is often performed in cases of Chiari network

endocarditis.[13] In our case, group G Streptococcal bacteremia and vegetation on the Chiari network resolved with prolonged antibiotic therapy. Despite its potential for systemic involvement, *S. canis* is often susceptible to narrow spectrum antibiotics, and may be treated with penicillin.[7]

This patient's exposure to zoonotic microorganisms from pets and recurrent micro trauma to her chronic venous stasis and lymphedema led to recurrent group G Streptococcal bacteremia causing endocarditis. Her IE could have been prevented by minimizing trauma from pet exposure to lower extremities, stricter management of her venous stasis and lymphedema, and frequent screening of her extremities for soft tissue infection.

4. Conclusion

We have shown a rare case of infective endocarditis (IE) with *S. canis* from domestic animals in the setting of congenital anomaly due to Chiari network. Given the high risk of complications from IE and high mortality, it is vital to obtain a detailed history including questions about domestic animals and occupational zoonotic exposure, as well as sanitary conditions to optimize risk factors. Optimizing risk factors for rare organisms and preventing trauma to open wounds to prevent recurrent bacteremia, and early screening for congenital anomalies are all ways to improve patient outcome in IE. Vegetation on the Chiari network can warrant early surgical intervention, however in our case appropriate antimicrobial therapy alone resulted in complete resolution with no sequelae. In future cases of IE affecting the Chiari network, a medical approach to surgical treatment can be explored, while monitoring with appropriate imaging modalities for the resolution of the vegetation and of any complications.

Conflict of Interest

None.

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