

The Root of the Problem: *Cardiobacterium Hominis* Endocarditis Complicated by an Aortic Root Abscess

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ABSTRACT

Introduction: Infective Endocarditis (IE) poses a persistent threat, with increasing incidence and mortality rates observed in recent decades. While gram-positive bacteria are the primary culprits, gram-negative organisms like *Cardiobacterium hominis* (*C. hominis*) from the HACEK group also contribute, albeit infrequently. We present a case illustrating the critical role of considering HACEK organisms, particularly *C. hominis*, in IE diagnosis.

Case Presentation: A 37-year-old female with bicuspid aortic valve stenosis and ascending aortic aneurysm presented with exertional dyspnea and acute abdominal pain. Imaging revealed an aortic root abscess and vegetation on a bioprosthetic aortic valve. Blood cultures identified *C. hominis*. The patient underwent multi-valvular replacement and aortic root reconstruction, achieving favorable post-operative recovery.

Discussion: *C. hominis* is a rare but formidable IE agent capable of causing severe complications like aortic root abscesses. This case underscores the imperative for clinicians to consider HACEK organisms in IE diagnosis, particularly in patients with prosthetic valves or predisposing conditions. Awareness of risk factors, such as dental procedures, is pivotal for timely intervention. Future research should concentrate on preventive strategies, including regular surveillance and prophylactic measures in high-risk individuals. This case underscores the importance of clinical vigilance in diagnosing and managing IE, emphasizing the necessity of identifying rare causative agents like *C. hominis* to optimize patient outcomes and mitigate associated morbidity and mortality.

Keywords: Endocarditis; Aortic Root Abscess; HACEK; Echocardiogram

Abbreviations: IE: Infective Endocarditis; AVR: Aortic Valve Replacement; TTE: Transthoracic Echocardiogram; TEE: Transesophageal Echocardiography

Introduction

Infective Endocarditis (IE) is a grave ailment associated with an unfavorable prognosis. Over the last three decades, there has been a consistent increase in the occurrence and fatality rates of IE [1]. In spite of advancements in diagnostic and treatment modalities, the one-year mortality from IE has remained unchanged for over two de-

cadecades [2]. Most cases of IE are attributed to gram-positive streptococci, staphylococci, and enterococci. Collectively, these three contribute to 80% to 90% of all cases [3]. *Cardiobacterium hominis* (*C. hominis*) is a member of the HACEK group, which includes *Haemophilus aphrophilus*, *Haemophilus paraphrophilus*, *Haemophilus parainfluenzae*, *Actinobacillus actinomycetemcomitans*, *C. hominis*, *Eikenella corrodens*, and *Kingella* species.

The HACEK group comprises gram-negative bacteria that are linked to infective endocarditis. This group is involved in 1.3-1.4% of endocarditis cases [4,5]. There have been 61 reported cases of endocarditis from *C.hominis* [6]. Specifically, *C.hominis* typically follows a subacute course that presents as symptoms related to valvular destruction or a septic embolic event. This case report describes the clinical course of a patient who developed an aortic root abscess secondary to gram negative bacteremia caused by *C.hominis*. The patient subsequently underwent a multi-valvular replacement and aortic root reconstruction. The purpose of this report is to underscore the importance of keeping HACEK organisms in consideration when determining the cause of infective endocarditis.

Case Presentation

Our patient is a 37-year-old female with a known history of bicuspid aortic valve stenosis and ascending aortic aneurysm for which she underwent aortic valve replacement (AVR) and arch repair with 23 mm Medtronic Mosaic bioprosthetic valve and Gelweave graft. She presented to our institution with a three-month history of pro-

gressively worsening exertional shortness of breath and acute onset abdominal pain. CT imaging was concerning for superior mesenteric artery rupture and splenic infarct; (Figure 1) however, her abdominal discomfort was short-lived and conservative management was pursued. Given progressively worsening dyspnea on exertion, a transthoracic echocardiogram (TTE) was obtained. This revealed the presence of a vegetation on the aortic valve bioprosthesis in addition to moderate to severe aortic regurgitation; TTE images were also suggestive of aortic root abscess. (Figure 2). Admission electrocardiogram showed normal sinus rhythm in the setting of first-degree AV block and chronic left bundle branch block. (Figure 3) Blood cultures were obtained, and the patient was started on broad spectrum antibiotics including vancomycin and cefepime. Interestingly, the patient had been afebrile and hemodynamically stable throughout the admission. On admission, the patient had an elevated white blood cell count of 11,600 and a C-reactive protein of 12.6. Physical examination revealed a holosystolic murmur rated at 4/6 and a diastolic murmur at the left sternal border rated at 4/6. The patient did not exhibit any additional findings related to IE including Osler nodes or Janeway lesions.

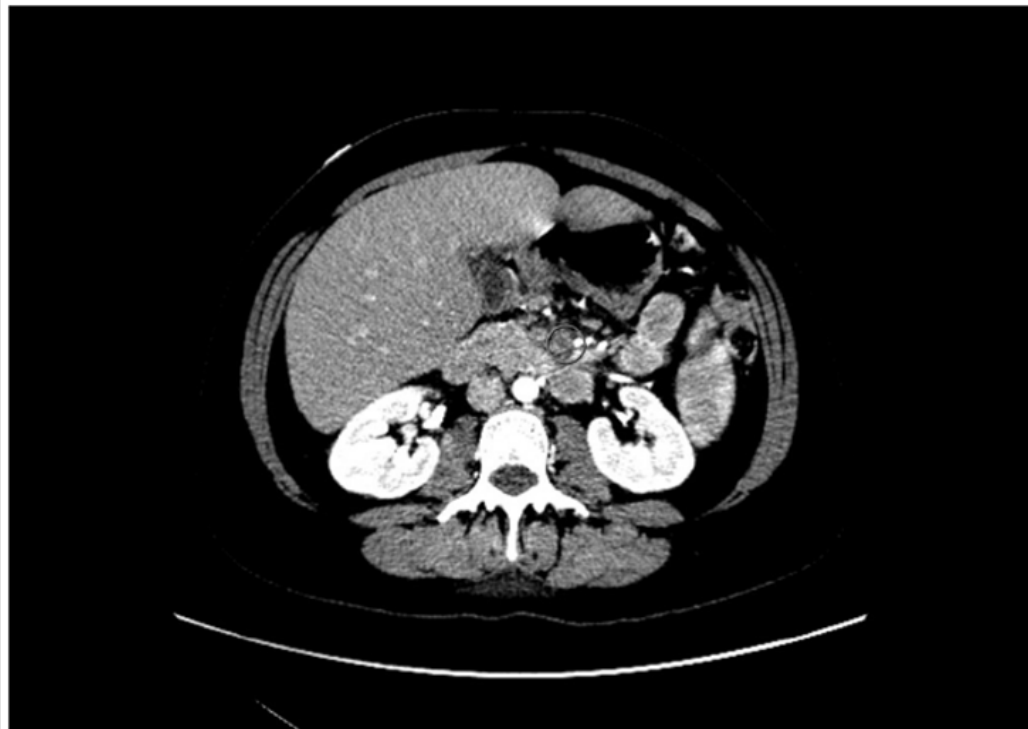


Figure 1: CT abdomen/pelvis obtained on admission showing concerns for superior mesenteric artery rupture and possible splenic infarct.

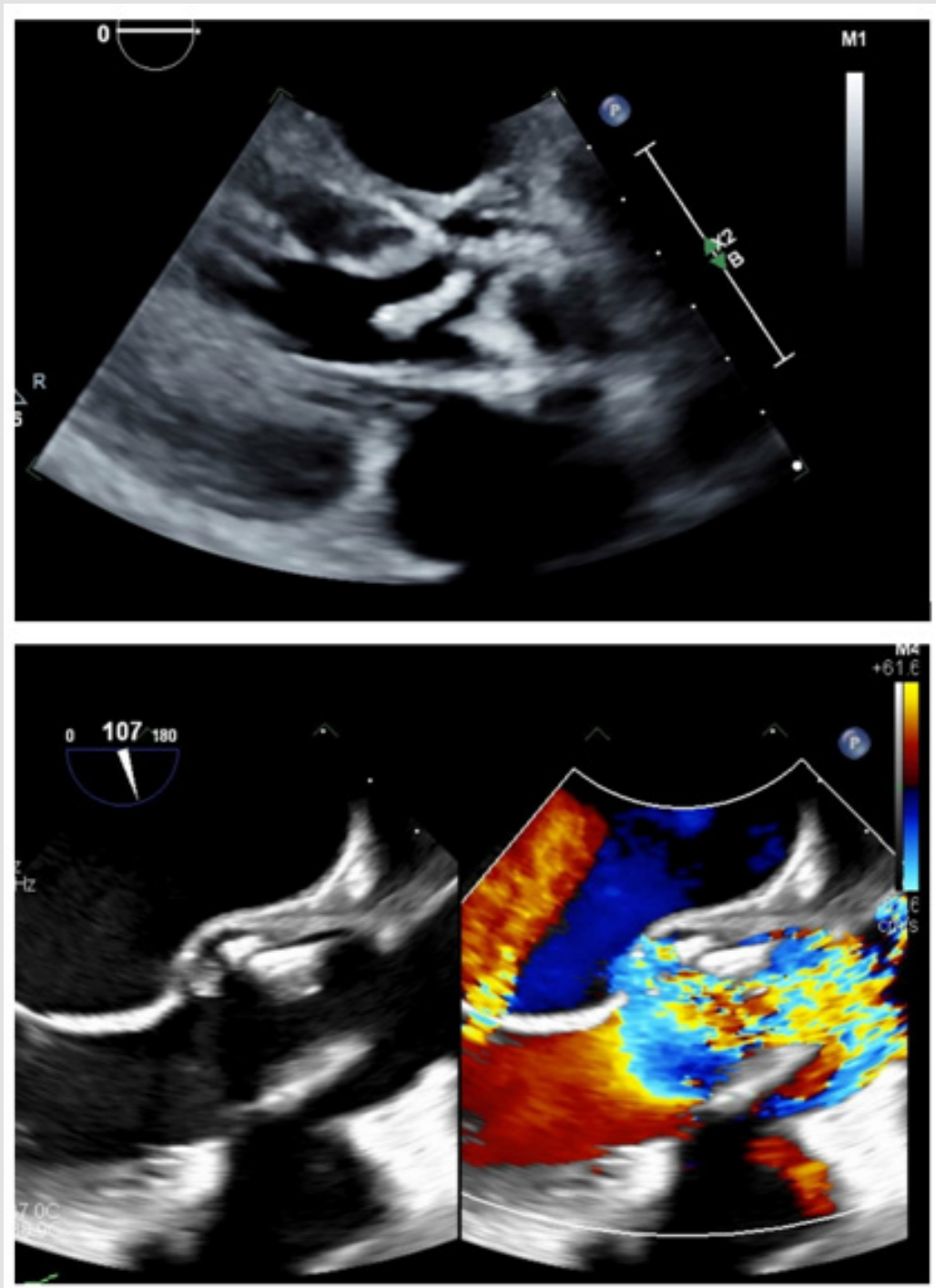


Figure 2: Transthoracic echocardiogram images with color doppler showing valve dehiscence.

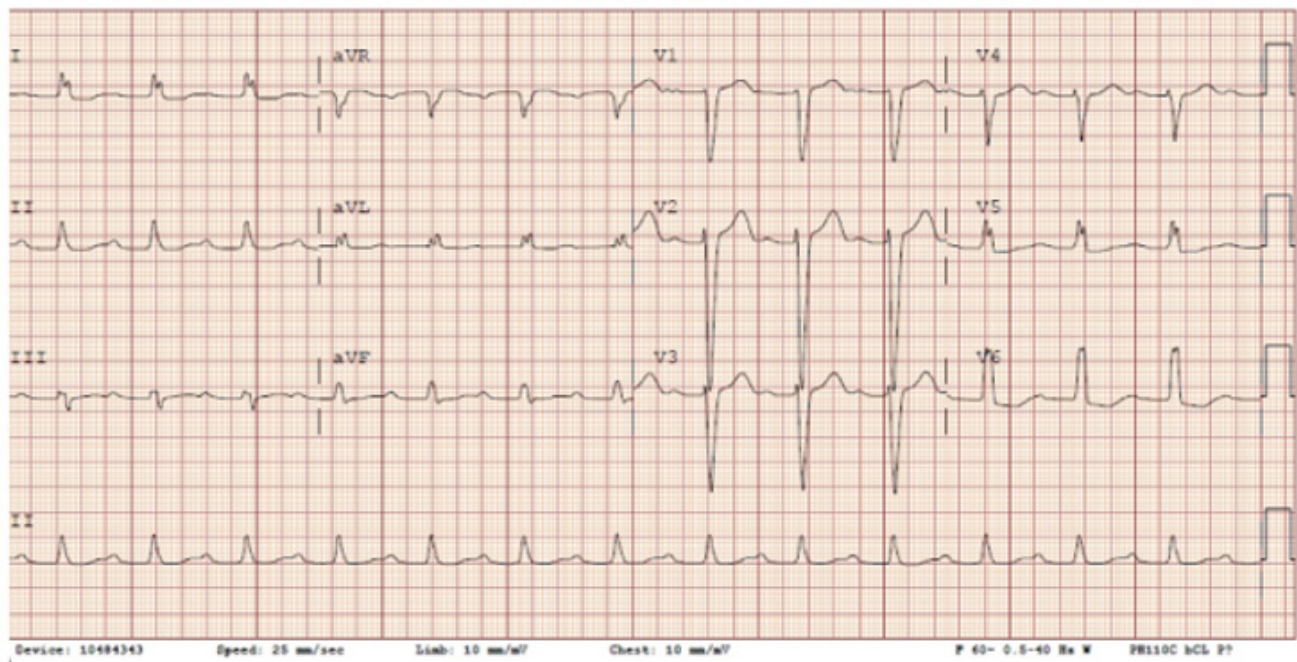


Figure 3: Electrocardiogram obtained on admission showing sinus rhythm with first degree AV-block.

Subsequently, the patient underwent transesophageal echocardiography (TEE) which showed a large mobile echogenicity attached to the aortic valve bio-prosthesis, dehiscence along the aortic-mitral continuity and a thickened periaortic region. (Figure 4) Despite negative blood cultures up until that point, the findings were thought to be consistent with highly complicated endocarditis of the bioprosthetic aortic valve with fistula and periaortic abscess. TEE also showed moderate mitral and tricuspid regurgitation; there was no evidence of endocarditis involving the mitral, tricuspid or pulmonic valves. On day five of growth, both blood cultures grew *C.hominis* and hence a

diagnosis of endocarditis complicated with paravalvular abscess was made. The patient was referred to quaternary center where she underwent redo-sternotomy with aortic valve and root replacement with a 24 mm aortic homograft, in addition to mitral and tricuspid valve repair. She received epicardial right atrial and right ventricular leads with generator placement without any significant complications [7]. As expected, surgical pathology of the valvular vegetation was consistent with bacterial endocarditis. The patient continued to do well in the immediate post-operative period and was successfully discharged home in stable condition.

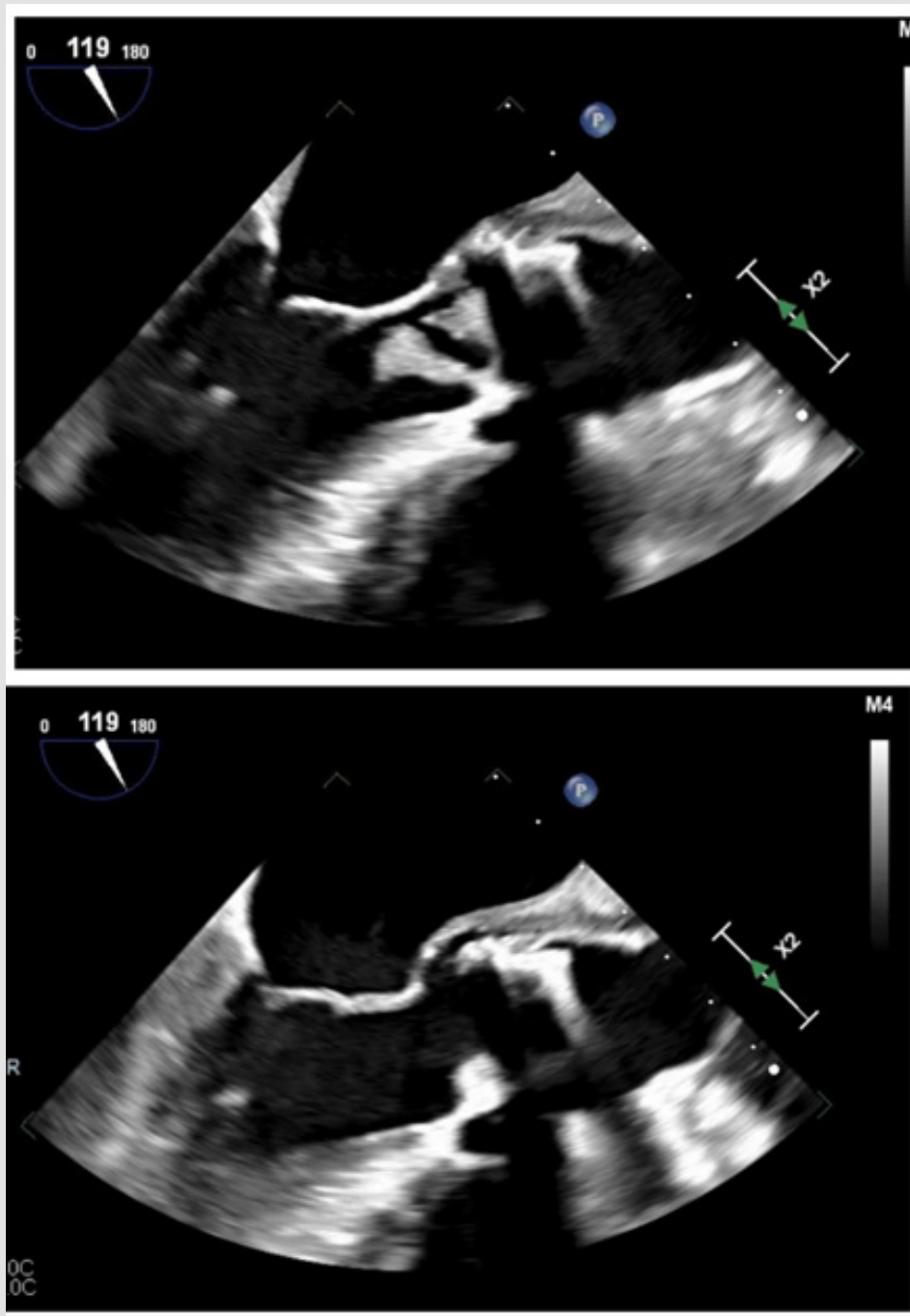


Figure 4: Transesophageal echocardiogram images showing valve dehiscence and fistula

Discussion

C. hominis is a pleomorphic gram-negative coccobacillus and is a colonizer of the human oropharynx. [8] *C. hominis* was detectable in the upper respiratory microbiota of 68% of normal individuals [9]. While not a particularly virulent pathogen, it leads to infective endocarditis (IE) in the vast majority of bacteremia cases. The risk

of IE is higher in susceptible individuals, such as those with valvular prostheses, pre-existing heart condition or recent dental procedures. The identification of *C. hominis* is challenging due to its notably slow growth rate and requirement for specialized growth media. It grows well on standard enriched media and demonstrates optimal growth with carbon dioxide and increased humidity [6,8]. Endocarditis due

to *C. hominis* is infrequent compared to other organisms in the HACEK group, with Hemophilus species having the highest prevalence, followed by Aggregatibacter spp. according to the findings of a large multinational cohort study [4]. Notably, endocarditis caused by *C. hominis* primarily targets the aortic valve, posing an increased risk especially in individuals with a bicuspid aortic valve [7].

It is a rare occurrence for abscess formation to ensue as a complication of endocarditis induced by *C. hominis*. A study done by Ono et al. in 2022 found that among the 44 previously reported *C. hominis* endocarditis cases included in the research, only 5 cases were associated with an abscess [8]. Moreover, there is evidence indicating that patients with bicuspid aortic valves are at a higher risk of developing aortic root abscesses [7,9]. This holds particular significance given that the patient described in our case report has a documented history of a bicuspid aortic valve. Our patient had multiple risk factors that appeared to increase her susceptibility to *C. hominis* endocarditis. Among these factors was the presence of a prosthetic valve. Also, a few weeks prior to their hospitalization, the patient underwent a dental extraction.

It is worth noting that the patient confirmed receiving antibiotic prophylaxis prior to the procedure. Several studies have suggested a potential link between inadequate oral hygiene and the occurrence of infective endocarditis. [7,10,11] Lochart et al. conducted a study involving 290 individuals, which revealed a significant correlation between dental extractions and toothbrushing with bacteremia leading to infective endocarditis [7,11]. Guidelines recommend antibiotic prophylaxis for infective endocarditis prior to dental procedures only for high-risk patients, such as those with valvular prosthesis, prior history of infective endocarditis or certain congenital heart conditions [12]. Prophylaxis is advised for any dental procedures that entail manipulation of either gingival tissue or perforation of oral mucosa [12].

The preferred antibiotic for treating infective endocarditis resulting from *C. hominis* infection is a third-generation cephalosporin, such as ceftriaxone [7,13]. Both strains within the HACEK group, whether producing β -lactamase or not, also exhibit susceptibility to ampicillin-sulbactam and fluoroquinolones [13]. The suggested treatment period for infection involving the native valve is 4 weeks, whereas for endocarditis affecting prosthetic valves, the recommended duration is extended to 6 weeks [7,13]. Given the considerable strain imposed on the healthcare system by infective endocarditis, it is imperative for future research to focus on avenues for prevention of the disease, especially in high-risk individuals. Some of the strategies that can be employed include testing quarterly blood cultures, prolonged antibiotic coverage after dental procedures and yearly transthoracic echocardiograms for susceptible patients.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work the authors used ChatGPT to enhance grammar and writing, ensuring accuracy and clarity

throughout the article. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Conflict of Interest

The authors declared no conflict of interest.

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All authors drafted the manuscript, critically revised the manuscript and reviewed the literature. All authors read and approved the final manuscript.

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Data Availability Statement

The authors declare that all the data supporting the findings of this study are available within the manuscript.

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