A Case Series of Eustachian Valve Endocarditis: An Under-Diagnosed and Rare Entity

ABDEF 1 Salman Salehin
EF 1 Deaa Abu Jazar
E 1 Peter R. Rasmussen
E 1 Steven L. Mai
F 1 Zaid Safer
F 1 Sarah Jenkins
B 1,2 Syed Mustajab Hasan
AEF 3 Joseph P. Hornak
ABDE 1,2 Muhammad W. Raja

Corresponding Author: Salman Salehin, e-mail: Sasalehi@utmb.edu

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Case series
Patients: Male, 62-year-old • Male, 57-year-old
Final Diagnosis: Eustachian valve endocarditis
Symptoms: Fever • shortness of breath
Medication: —
Clinical Procedure: —
Specialty: Cardiology • Infectious Diseases • General and Internal Medicine

Objective: Rare disease
Background: The eustachian valve is rarely involved in bacterial endocarditis. Patients who present with bacteremia and evidence of organic septic emboli should raise the suspicion of endocarditis as a possible differential diagnosis. This case series describes 2 unique cases of eustachian valve endocarditis (EVE) in patients who had a history of intravenous drug use; although 63% of EVE is caused by Staphylococcus aureus, the causative agent in our first case was methicillin-resistant Staphylococcus epidermidis (MRSE), which is only the third reported case of EVE caused by Staphylococcus epidermidis. Of note, the previous 2 cases of MRSE EVE were also found to be associated with cardiovascular hardware.

Case Reports: The first case of the series describes EVE by MRSE with an endovascular graft acting as the nidus of infection. Second case of EVE was caused by methicillin-sensitive Staphylococcus epidermidis (MSSA), the source of bacteremia being a rectovesicular abscess. Although initial transthoracic echoes were negative in both cases, subsequent transesophageal echoes were able to detect vegetations on the eustachian valves. Treatment included 4-6 weeks of culture-directed antibiotic therapy for both of our cases.

Conclusions: EVE may be an under-diagnosed sequelae of staphylococcal bacteremia, especially in the intravenous drug abuse population, further reinforcing the importance of systemically visualizing all cardiac valves, including the eustachian valves, while performing echocardiography.

Keywords: Echocardiography • Echocardiography, Transesophageal • Endocarditis • Endocarditis, Bacterial • Staphylococcus epidermidis

Abbreviations: EVE – eustachian valve endocarditis; MRSE – methicillin-resistant Staphylococcus epidermidis; MSSA – methicillin-sensitive Staphylococcus aureus; IVC – inferior vena cava; RA – right atrium; TTE – transthoracic echocardiogram; TEE – transesophageal echocardiogram; HCV – hepatitis C virus; BPH – benign prostatic hyperplasia; CRP – C-reactive protein

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/936279
Background

The eustachian valve is located at the junction of the inferior vena cava (IVC) and the right atrium (RA) in approximately 25% of individuals [1,2]. On imaging, its appearance is that of an elongated, membranous structure extending from the IVC to the border of the fossa ovalis [1,2]. It is relatively easily visualized on routine transthoracic echocardiogram; however, it is rarely involved in bacterial endocarditis, with only a handful cases reported since it was first described in 1986, which was actually diagnosed at autopsy [3]. The main predisposing factor is intravenous drug use and the most common causative agent is *Staphylococcus aureus* [4]. Pacemaker wires, history of rheumatic heart disease, and indwelling vascular lines/catheters/devices are important causes as well [1-7]. Here, we describe recent experience with EVE at our academic medical center, including 1 case of methicillin-resistant *Staphylococcus epidermidis* (MRSE) infection, making this only the third reported case of EVE to have been caused by *S. epidermidis*. The first 2 cases of MRSE EVE were found to be associated with intracardiac hardware [8].

Case Report

Case 1

A 62-year-old man with past medical history of hypertension, methamphetamine abuse, and aortic dissection s/p endovascular graft repair (1 month prior) was admitted due to sudden onset of severe left lower extremity pain. CT angiography of the lower extremities showed popliteal occlusion, for which the patient underwent emergency embolectomy. Of note, he had an acute embolic stroke just 10 days prior, but a transthoracic echocardiogram (TTE) had failed to show an embolic source at that time.

Initial labs on admission showed leukocytosis and mild thrombocytosis. EKG showed no new interval changes compared to prior tracings. Initial (and repeat) blood cultures were positive for methicillin-resistant *Staphylococcus epidermidis*, with high suspicion for involvement of thoracic aorta vascular graft (which was placed 1 month prior). Multiple septic emboli were thought to explain acute limb ischemia and recent stroke. As such, transesophageal echocardiography (TEE) was pursued given persistent bacteremia and strong suspicion for a cardioembolic origin. TEE showed a large, echogenic, mobile mass measuring 1.7×1.3 cm attached to the eustachian valve along the RA wall, consistent with valvular vegetation ([Figure 1, Video 1](#video1)). It is also possible that this vegetation adhered to, and obscured on echocardiogram, an underlying Chiari Network adjacent to the EV, which could be the primary locus of this patient’s endocarditis. However, there was no evidence of atrial septal or ventricular septal defect to suggest EV vegetations as a cause of systemic embolism. Subsequent CT chest imaging showed acute intramural thrombus or hematoma spanning the entire aortic stent graft, possibly due to an endoleak, which was the likely source of thromboembolism. The thrombus and vascular graft were likely the source of infection as evidenced by the persistent staphylococcal bacteremia. Similarly, the bacteremia was likely the cause of the EV vegetation due to hematogenous spread as opposed to spontaneous formation of a vegetation on the EV leading to graft infection. The thrombus and vascular graft were also probably infected in the setting of persistent staphylococcal bacteremia. Cardiothoracic surgery did not offer any surgical option for the patient.

![Figure 1. Related to Case 1: Two-Dimensional transesophageal echocardiogram showing Eustachian valvular vegetation. The red arrow clearly marks the vegetation on the eustachian valve itself. ‘RA’ refers to the right atrium and ‘LA’ refers to the left atrium in Figure 1.](#fig1)

![Video 1. Related to Case 1: Transesophageal echocardiogram showing eustachian valvular vegetation.](#video1)
management in this case given deteriorating overall clinical condition and multiple uncontrolled comorbidities. His subsequent hospital course was complicated by ventilator-associated pneumonia. Due to inability to achieve source control of infection, namely the endovascular graft, the patient continued to deteriorate despite antibiotic therapy. Unfortunately, he died on day 12 of hospitalization.

Case 2

A 57-year-old man with past medical history of HCV infection (on treatment with sofosbuvir and velpatasvir), rectal prolapse in 2011, intravenous drug abuse, and BPH who presented to the emergency department for rectal bleeding of 2 weeks duration. In addition, he had left knee pain and swelling for 10 days, to the point where he required crutches to ambulate. He also mentioned burning with micturition and fever for the last 5 days. Of note, he had an indwelling Foley catheter, which was placed 1 month prior to admission due to acute retention deemed secondary to BPH. He failed a voiding trial 1 week prior to admission, hence the catheter was not removed. Vitals at initial assessment were as follows: blood pressure 151/67 mmHg, pulse 105 beats per minute, temperature 38.4°C, respiratory rate 18/minute, and an oxygen saturation of 95% on room air. Physical exam findings were grossly unremarkable apart from trace pitting edema bilaterally. An EKG showed sinus tachycardia with evidence of possible left atrial enlargement with broad, notched P waves. Initial laboratory results showed a WBC count of 12.9×10³/mm³, Platelet count 625 000 (reference range: 150-328), ESR-97 mm/hr (reference range: 0-20 mm/hr), and CRP 21.30 mg/dl (normal <0.8 mg/dl). Urinalysis revealed 121 WBCs/hpf and positive leukocyte esterase; urine drug screen was negative. X-ray films of the chest and left knee were unremarkable. The next day, urine cultures came back positive for methicillin-resistant Staphylococcus aureus (MRSA) and blood cultures came back positive for methicillin-sensitive S. aureus (MSSA). Left knee arthrocentesis was promptly performed and cultures subsequently grew MSSA. This patient was initially treated with left knee open arthrootomy including irrigation and debridement by Orthopedics; and Cefazolin was started as well. Given MSSA bacteremia, a trans-thoracic echocardiogram (TTE) was ordered to rule out infective endocarditis. No vegetations were visualized but the mitral valve was found to be mildly thickened. Five days later, in light of persistent bacteremia and ongoing fevers, the decision was made to obtain a TEE, which revealed a large, echogenic mobile mass measuring 1.7×1.3 cm attached to the eustachian valve along RA wall (Figure 2, Video 2). This was deemed to be evidence of EVE. To locate a definitive source of MSSA, a CT abdomen/pelvis was ordered, which did show a rectovesicular abscess, measuring 7.2×4.7×8.5 cm in size, with involvement of seminal vesicles and prostate. Subsequent percutaneous drainage was performed by interventional radiology and the fluid aspirate culture grew MSSA. Clinically, the rectovesicular abscess was thus deemed to be the primary source of his bacteremia. Blood cultures following drainage of the abscess remained negative. It was recommended that the patient complete a total of 6 weeks of cefazolin therapy from the first day of negative blood cultures. CT surgery did evaluate the patient during hospitalization but decided that there were no indications for surgical management. He did well on the 6 weeks of antibiotics without the need for readmission. He is alive and doing well at this time.
Discussion

Infective endocarditis refers to bacterial or, rarely, fungal infection of the endocardium. The EV, a remnant of the right sinus venous valve, located at the junction of the IVC and RA, can rarely become a focus of infection [1,2]. These 2 cases illustrate the importance of orderly evaluation of the EV during echocardiography in all patients with suspected endocarditis, as well as careful evaluation of atrial septal patency due to risk of cerebral and/or systemic embolization from right-sided complications. This systematic approach would help prevent missing EVE during routine studies, as recent studies have shown that EV involvement may be more common than previously thought [2-5,7]. The literature suggests that both TTE and TEE provide similar information for the diagnosis of EVE; however, more recent literature have suggested that TEE is a more sensitive diagnostic tool than TTE with regards to detected EVE, although it is generally most practical to start with TTE [1-4,7-10].

In addition, TEE would be an important diagnostic tool if there is a lack of clinical response to antibiotic therapy to detect possible complications such as abscesses, fistulas, valve perforations, prolapse, aneurysm/pseudoaneurysm formation, or papillary muscle/chordal rupture. Importantly, TEE is less sensitive for detecting these features of so-called “paravalvular involvement.”

EVE usually follows a benign clinical course, resolving with a 4-6-week course of culture-directed antibiotic therapy from first negative cultures. The choice of antibiotics for Staphylococcus epidermidis remain similar to the choice of antibiotics for Staphylococcus aureus, with vancomycin being the preferred treatment for methicillin-resistant (MRSA) strains and penicillin-resistant penicillins or “anti-staphylococcal penicillins” such as nafcillin or the first-generation cephalosporin cefazolin being the preferred treatment for MSSA. Surgical management is reserved for vegetations that do not resolve with anti-microbials and for hemodynamically compromising vegetations.

Conclusions

Our cases illustrate the importance of thoroughly evaluating the valves, including EV, during echocardiography in all patients with suspected endocarditis or cardiac embolization, as well as careful evaluation of atrial septal patency. This systematic approach would help prevent missing EVE during routine studies. Importantly, TEE is a more sensitive tool than TTE to diagnose EVE. Thus, TEE should be considered when right-sided endocarditis is suspected but TTE is negative, especially in the setting of persistent bacteremia, presence of risk factors, or evidence of single or multiple septic emboli. In addition, an ongoing poor clinical response in known cases of endocarditis should prompt a TEE to rule out complications such as abscesses, fistulas, valve perforations, prolapse, aneurysm/pseudoaneurysm formation, or papillary muscle/chordal rupture.

Case 1 describes only the third reported case of EVE to have been caused by Staphylococcus epidermidis, with the 2 prior cases having infected intracardiac hardware and this case having MRSE infection of the vascular graft.

Our case series also highlights the significance of recognizing the risk factors of endocarditis, including eustachian valve endocarditis. In such instances, it is essential that all valves are interrogated thoroughly in a systematic way, including the eustachian valve, especially when there is a high suspicion for infective endocarditis.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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