



# Ventricular Standstill in a Patient with Infective Endocarditis

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## Abstract

Infective endocarditis can be associated with myocardial abscesses. *Staphylococcus aureus* is most often the causative organism. Myocardial abscesses can lead to conduction abnormalities. Ventricular standstill is a rare electrophysiological phenomenon where atrial activity exists without ventricular activity. We report a case of aortic valve endocarditis with associated interventricular septum abscess. A new VSD developed. The patient also experienced episodes of ventricular standstill, requiring transcutaneous pacing.

## Introduction

Infective Endocarditis (IE) is an inflammation of the endocardium with or without involvement of the heart valves. IE is mainly caused by bacterial infection, the most common organism being *Staphylococcus aureus* [1-4]. A multitude of cardiac complications can arise with IE, including valvular insufficiency leading to acute heart failure and atrial enlargement leading to arrhythmias [1,2]. A more uncommon complication is the development of intracardiac abscesses (14% to 30%), or even more uncommon, the development of atrioventricular blocks (8%) [1-3].

An interventricular abscess is most commonly seen in IE involving the aortic valve [3,4]. The development of Atrioventricular (AV) node dysfunction can be explained by the proximity of the AV node by the aortic valve [4].

Ventricular standstill is an electrophysiological phenomenon where P-waves are seen on electrocardiography without any accompanying QRS-complexes [5]. No previous case reports have been reported of a patient with IE who developed ventricular standstill without previous underlying conduction defects.

## Case Presentation

A 36-year-old female with a past medical history of intravenous drug use and depression presented to the hospital with diaphoresis and confusion. She responded well to intravenous fluids and benzodiazepines, and was discharged home from the emergency department. She was brought back to the hospital three days later with altered mental status. Blood cultures from her first visit had grown Methicillin-Sensitive *Staphylococcus aureus* (MSSA). During this visit she was found to have severe sepsis, with a lactic acid level of 3.1 mmol/L. She was started on vancomycin. Shortly after admission she developed respiratory distress and tachycardia. An Electrocardiogram (ECG) showed sinus tachycardia with a normal PR-interval. Because of her hemodynamic instability, she was transferred to the intensive care unit. An echocardiogram revealed an aortic valve vegetation and a potential interventricular septum abscess (Figure 1a, 1b). Repeat blood cultures grew MSSA. Overnight, the patient experienced episodes of ventricular standstill (Figure 2). She never lost consciousness during these episodes. A transcutaneous pacemaker was placed. A repeat ECG again showed sinus tachycardia with a normal PR-interval. An echocardiogram was repeated and again showed the aortic valve vegetation, but now also showed a ruptured interventricular septum abscess with a new interventricular septum defect (Figure 3a, 3b). Because of her history of intravenous drug use, multiple comorbidities, and her poor prognosis, no cardiac surgery was considered. The patient remained encephalopathic throughout her hospital course. She developed multi-organ failure. The patient's family decided to go with hospice care and the patient was discharged to the inpatient hospice unit where she ultimately passed away.

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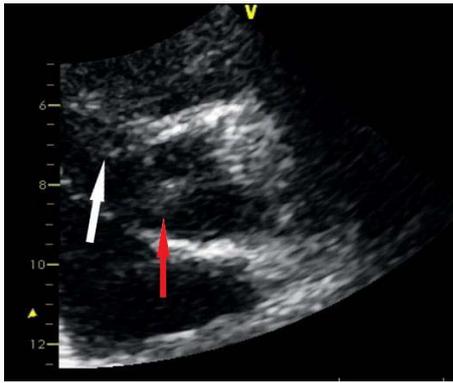
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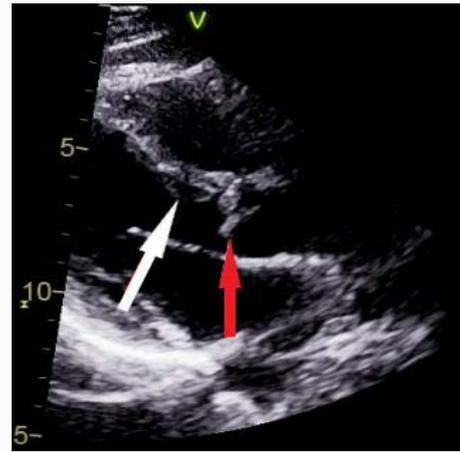
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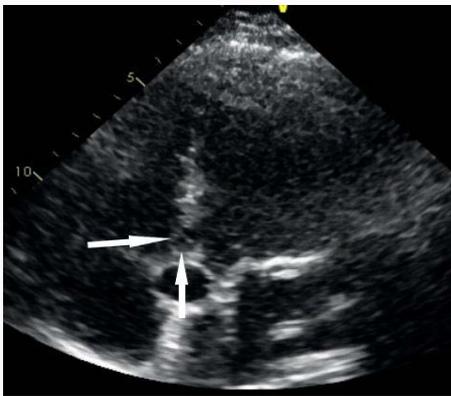
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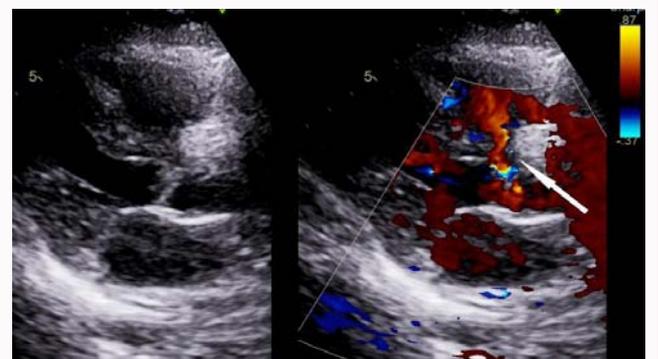
**Figure 1a:** Parasternal long axis view on echocardiogram revealing an aortic valve vegetation (red arrow) and interventricular septum abscess (white arrow).



**Figure 3a:** Parasternal long axis view on echocardiogram revealing increased size of the aortic valve vegetation (red arrow) and increased size with potential rupture of the interventricular septum abscess (white arrow).



**Figure 1b:** Four-chamber view on echocardiogram showing an interventricular septum abscess (white arrows).



**Figure 3b:** Doppler imaging of the parasternal long axis view revealing flow from the left ventricle to the right ventricle (white arrow).

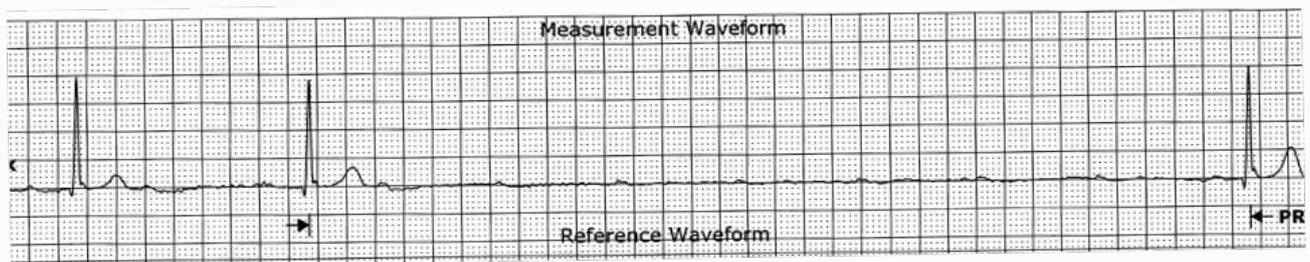
**Discussion**

Although aortic valve endocarditis is associated with abscesses in 20% to 30% of cases, the development of an interventricular septum abscess remains rare [3,4]. Aortic valve endocarditis leads to an abscess, usually located in the weaker part of the annulus near the AV node [4]. This explains why AV-block often occurs with aortic valve abscesses. A PR-prolongation can be seen and is associated with a poor prognosis [6]. Our case demonstrates that abscesses related to aortic valve endocarditis can present without PR-prolongation.

Our patient had a total of 3 ECGs without PR-interval prolongation. This is potentially explained by the location and acute enlargement of the abscess.

Our patient developed a rare electrophysiological phenomenon,

referred to as ventricular standstill. This indicates the development of a high-grade AV block. It is usually associated with an increased vagal tone. It is unusual for these patients to present without syncope, as the cardiac output during these episodes is essentially zero [5,7]. Our patient, although altered, did not lose consciousness during the many episodes of ventricular standstill she experienced. Treatment of high-grade AV block and ventricular standstill consists of permanent pacemaker implantation [5]. Our patient underwent transcutaneous pacing as she was not deemed a surgical candidate. The mechanism of the ventricular standstill in our patient could potentially be explained by the interventricular abscess interfering with the His-Purkinje system below the AV-node. As there was a VSD present, the possibility exists that the conduction system was destroyed near the isthmus.



**Figure 2:** Telemetry strip showing atrial activity (arrows) without ventricular response.

Treatment of IE consists of intravenous antibiotics [1,2]. In the case of myocardial abscesses, early surgical intervention is often necessary for full recovery [3,4]. Our patient was not deemed a surgical candidate due to her multiorgan failure and IVDA.

In conclusion, aortic valve endocarditis is associated with conduction abnormalities due to its anatomic relation to the AV-node. Telemetry monitoring and daily electrocardiogram are warranted in any patient with aortic valve endocarditis. Complete heart block can occur, even without preceding PR-interval prolongation. Repeat echocardiogram should be obtained and early surgical intervention is necessary.

### Disclaimer

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