

Significant PR Prolongation and New Onset Left Bundle Branch Block in Aortic Root Abscess: A Marker of Disease Progression and Poor Prognosis

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Abstract Infective endocarditis (IE) is a serious medical condition with a high morbidity and mortality rate. *Staphylococcus aureus* is the most common etiologic organism in IE. While echocardiography plays an important role in diagnosis and management of IE, the electrocardiogram (ECG) is helpful in determination of disease progression as well as in prognostication. We present a case of a 72-year-old man who was diagnosed with IE following methicillin resistant *Staphylococcus aureus* (MRSA) bacteremia. The course of hospitalization was complicated with multiple septic-embolic strokes and aortic root abscess. Serial ECG revealed PR prolongation and new onset left bundle branch block (LBBB) before the patient became terminal. Our case highlights the utility of serial ECGs monitoring in the patients with IE that may reveal subtle ECG findings, such as PR prolongation and LBBB. These findings which might serve as a clue of the presence of peri-annular extension of IE, help in prognostication and aid in the therapeutic decision-making such as early surgical intervention in these high-risk patients with poor prognosis. In this report, we also present the pathophysiologic mechanisms underlining the ECG changes in patients with aortic valve endocarditis.

Keywords: *infective endocarditis, PR prolongation, left bundle branch block, aortic root abscess, prognosis*

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1. Introduction

Infective endocarditis (IE) is a serious disease with a high morbidity and mortality. Modified Duke's criteria guide the diagnosis of IE [1]. Though the overall incidence of IE has remained stable, the incidence of *Staphylococcus aureus* IE has increased. *S. aureus* is now the most common organism causing IE in the industrialized world [2,3]. Echocardiography plays a vital role in diagnosis and management of IE [1]. However, the subtle electrocardiogram (ECG) signs are often neglected and may hold a clue to disease progression and prognosis in IE. We present a case of a 72-year-old man with a history of end stage renal disease and renal transplant 6 years ago who presented with fever and back pain in whom investigations revealed endocarditis and aortic root abscess secondary to *S. aureus* sepsis. Hospitalization course was complicated by multiple embolic strokes

despite being on appropriate antibiotic therapy. Analysis of ECG revealed progressive PR segment prolongation. We discuss the clinical significance of these ECG findings in aortic root abscess.

2. Case Report

A 72-year-old male with a medical history of hypertension, diabetes, hyperlipidemia, end stage renal disease on hemodialysis through right arm arteriovenous fistula, history of kidney transplant twice and on immunosuppression with prednisone and tacrolimus presented with a fever of 104 degree Fahrenheit. At presentation heart rate was 89 beats/minute, blood pressure was 160/92 mmHg, and respiratory rate was 18 cycles per minute. Cardiovascular, respiratory and abdominal examinations were within normal limits. White cell count was 8.6 (Normal reference range 4.10 - 10.10 $10^3/uL$), however, the neutrophil differential was 89%. Electrolyte

were within normal limit, blood urea nitrogen was 48 mg/dL (9.0 - 20.0 mg/dL) and serum creatinine was 4.1 mg/dl (normal range: 0.66 - 1.25 mg/dL) for which hemodialysis was continued. Initial ECG revealed normal sinus rhythm with a PR interval of 160 milliseconds and nonspecific ST-T changes (Figure 1). Initial troponin was 19.9 ng/ml (normal range 0.000 - 0.034 ng/mL) hence a diagnosis of non-ST segment myocardial infarction was made and anticoagulation with heparin drip was initiated. Blood cultures grew methicillin resistant staphylococcus aureus (MRSA) for which vancomycin was initiated and rifampin was added to the antibiotic regimen for better tissue penetration. The patient reported a prior history of sepsis secondary to MRSA with complete recovery four months ago. During this admission echocardiography revealed echocardiography revealed a 10 mm oscillating mass on the right coronary

cuspid of the aortic valve suggestive of infective endocarditis (Figure 2). He was intubated for acute respiratory failure. On day three of hospitalization, patient developed altered mental status. Magnetic resonance imaging (MRI) of the brain revealed mild intraventricular hemorrhage in the lateral ventricles, mild biparietal subarachnoid hemorrhage, and multiple small acute infarcts in the bilateral cerebral and cerebellar hemispheres. These brain infarctions in multiple territories in the bilateral frontal, bilateral parietal and bilateral cerebellar areas suggesting embolic nature of the stroke. Cardiothoracic surgery declined aortic valve replacement due to multiple strokes and related poor prognosis. Patient subsequently passed away on day 10 of hospitalization. Patients PR duration progressively increased during hospitalization as in image and LBBB on day 10 of hospitalization (Figure 5, Figure 6).

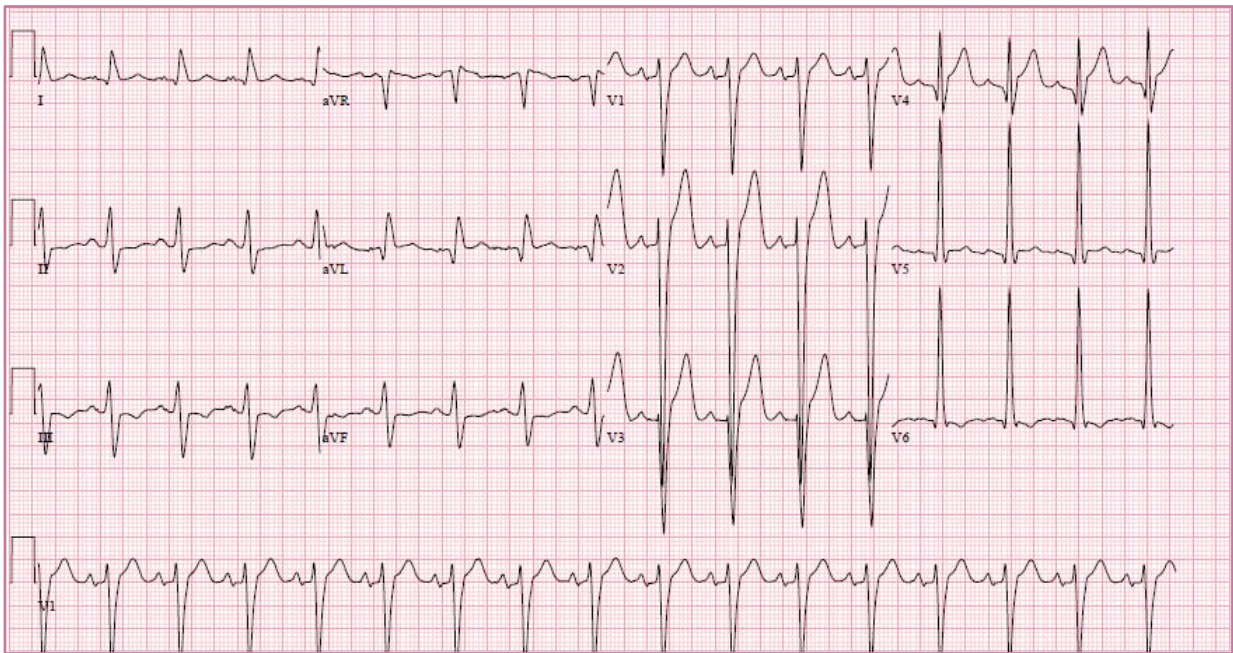


Figure 1. ECG showing normal sinus rhythm, normal QRS duration and left ventricular hypertrophy

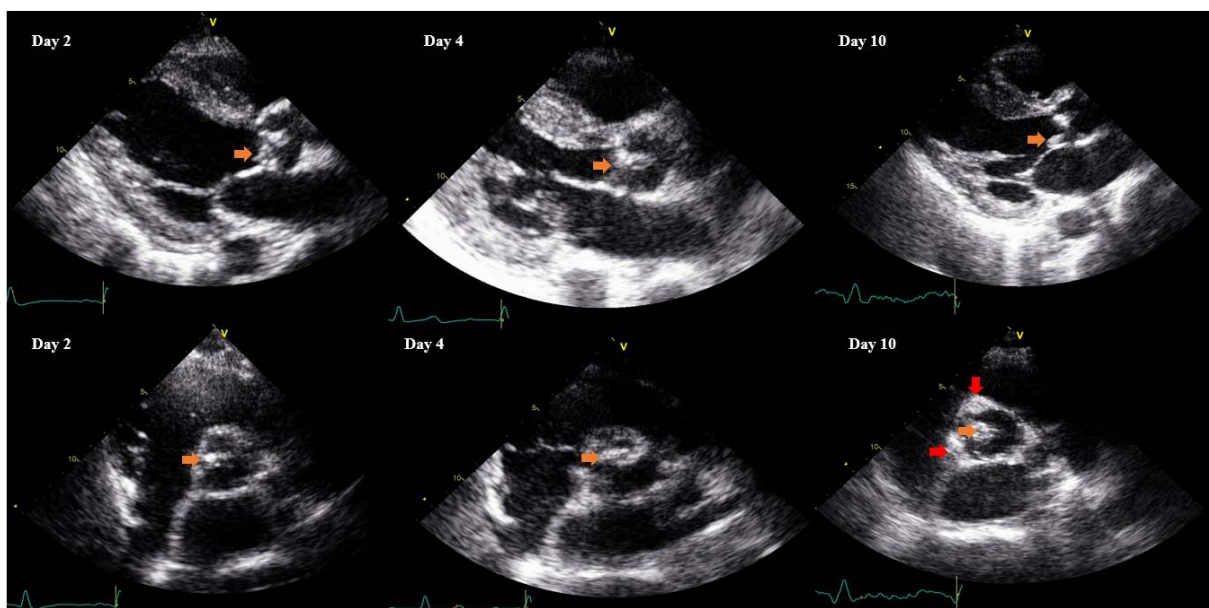


Figure 2. Transthoracic echocardiography images: top row is parasternal long axis view and bottom row is parasternal short axis view. Saffron arrow indicating infective endocarditis vegetation on aortic valve and red arrow indicating aortic root abscess

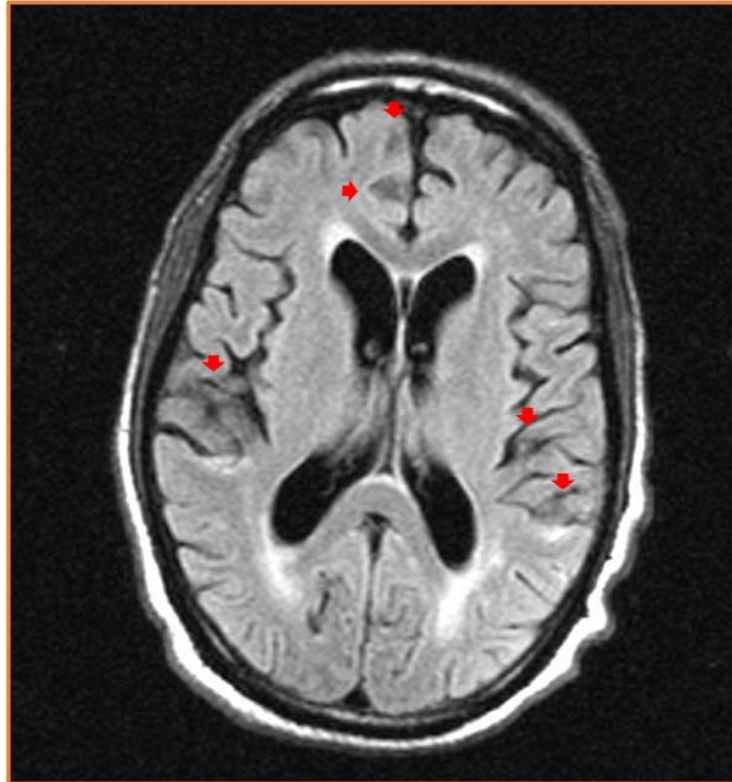


Figure 3. MRI Brain of the patient showing multiple punctate foci (red arrows) of restricted diffusion in the bilateral frontoparietal lobes consistent with thromboembolic stroke. Also note periventricular T2 flair hyperintense signal suggesting demyelination

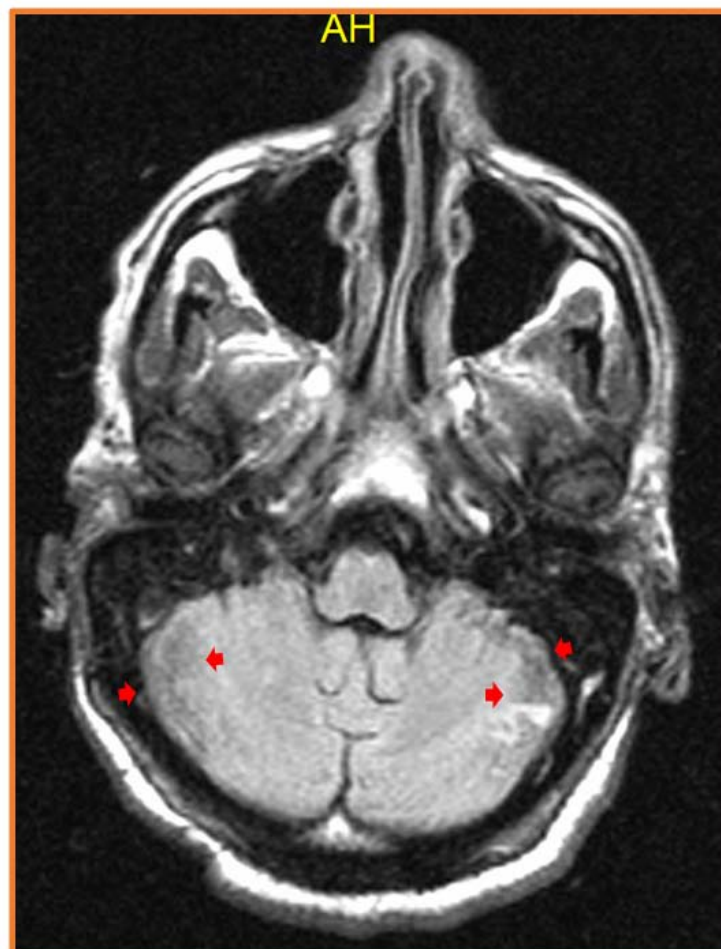


Figure 4. MRI Brain of the patient showing multiple punctate foci of restricted diffusion in the bilateral cerebellar lobes consistent with thromboembolic stroke

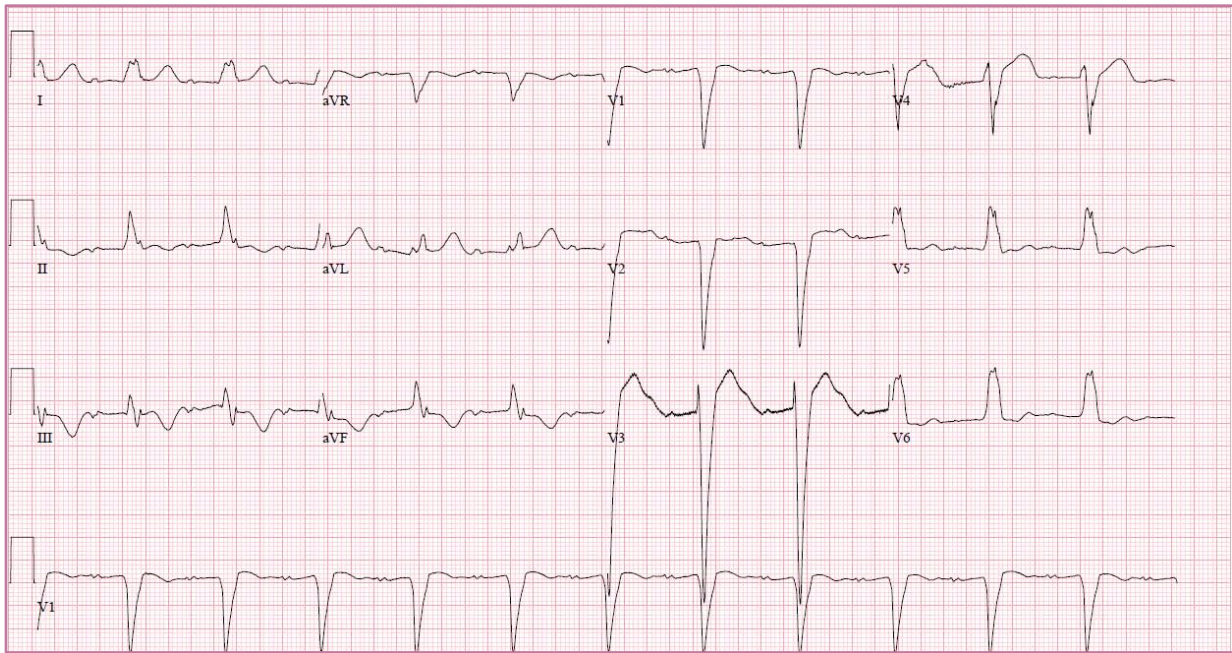


Figure 5. EKG showing prolongation of PR interval and appearance of LBBB

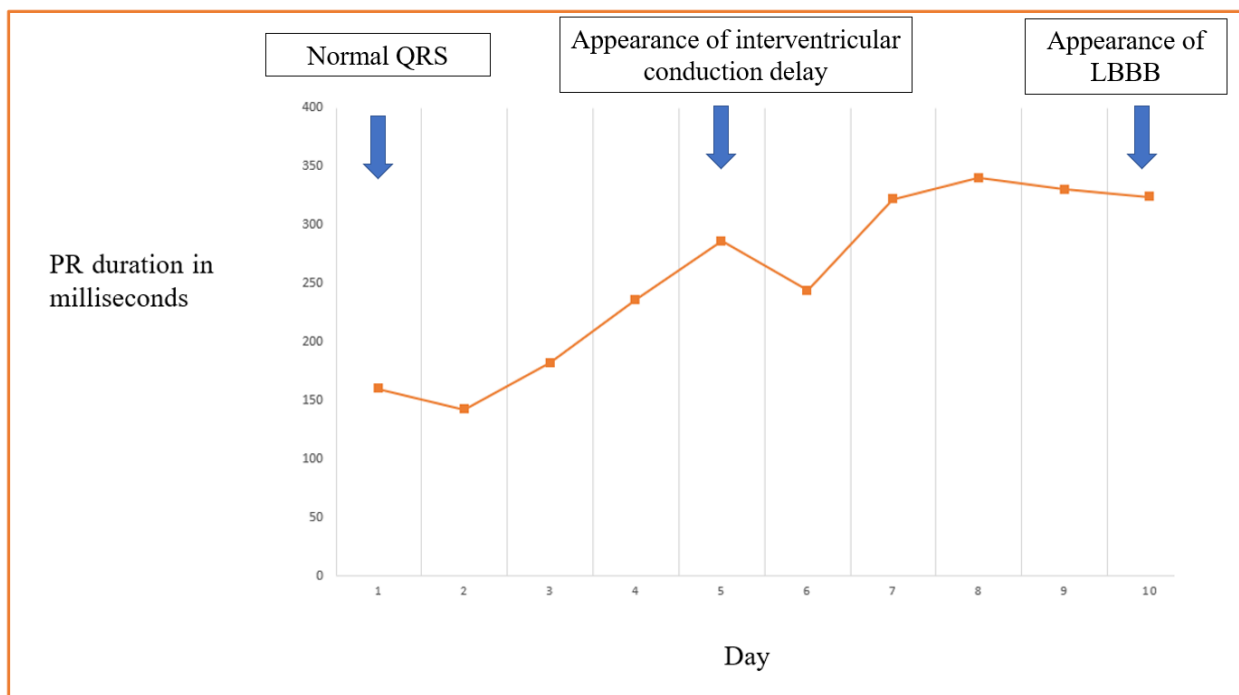


Figure 6. Graph showing the timeline of prolongation of the PR interval and appearance of LBBB

3. Discussion

Periannular extension is a common complication of IE with the prevalence of 10-40% [4,5]. It is associated with a poor prognosis [4,5]. Periannular infection is more commonly seen in aortic endocarditis than mitral or tricuspid valve involvement [5]. The conduction system of the heart is in close proximity to the aortic valve; the AV node is located in the apex of the triangle of Koch whose boundaries are formed by the anterior margin of coronary sinus, tricuspid annulus, and the tendon of Todaro, in the right atrium (Figure 4, Figure 5). Then, the conduction system travels leftward, penetrates the central fibrous skeleton and appears between right and noncoronary cusps.

Finally, the conduction bundle divides into left and right bundle branches [6,7]. Given this close anatomic relation the conduction abnormalities, such as complete heart block and bundle branch blocks have been commonly reported as the complications of periannular infection [8-13] (Figure 7 and Figure 8). However, to the best of our knowledge, cases of isolated PR prolongation in aortic root abscess is sparsely reported [14]. In this case report, we presented a patient who developed PR prolongation as an early sign of periannular extension. The aortic valve vegetation tends to extend through the weaker part of the annulus which is the membranous interatrial septum which contains the AV node, to form aortic root abscess [15]. The AV conduction delay can happen when

IE is associated with aortic root abscess [14]. Therefore, detecting PR prolongation on the serial ECGs following aortic valve endocarditis might be a clue of

aortic root abscess formation. LBBB can also occur due to the close proximity of the left bundle to an aortic valve [14].

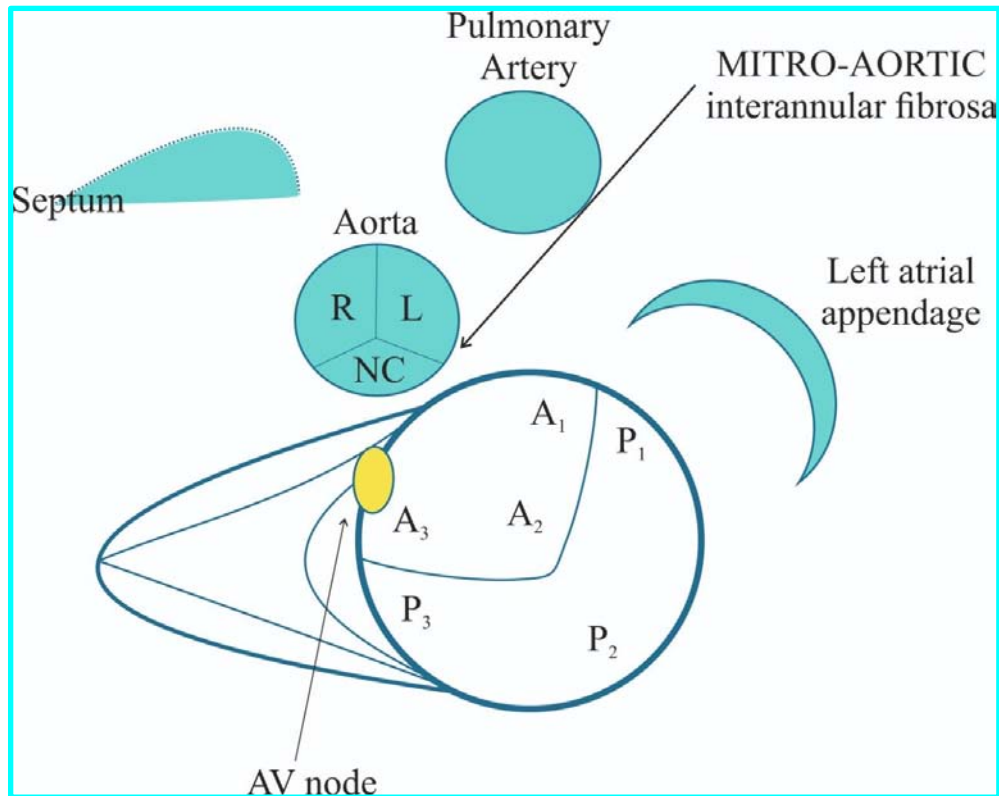


Figure 7. Showing the relation of AV note to surrounding anatomy. Note its close proximity to the aortic valve. (R, L, NC stands for right, left and noncoronary cusp of the aortic valve; A1, A2, A3 are the leaflets of the anterior mitral valve and P1, P2, P3 are leaflets of the posterior mitral valve)

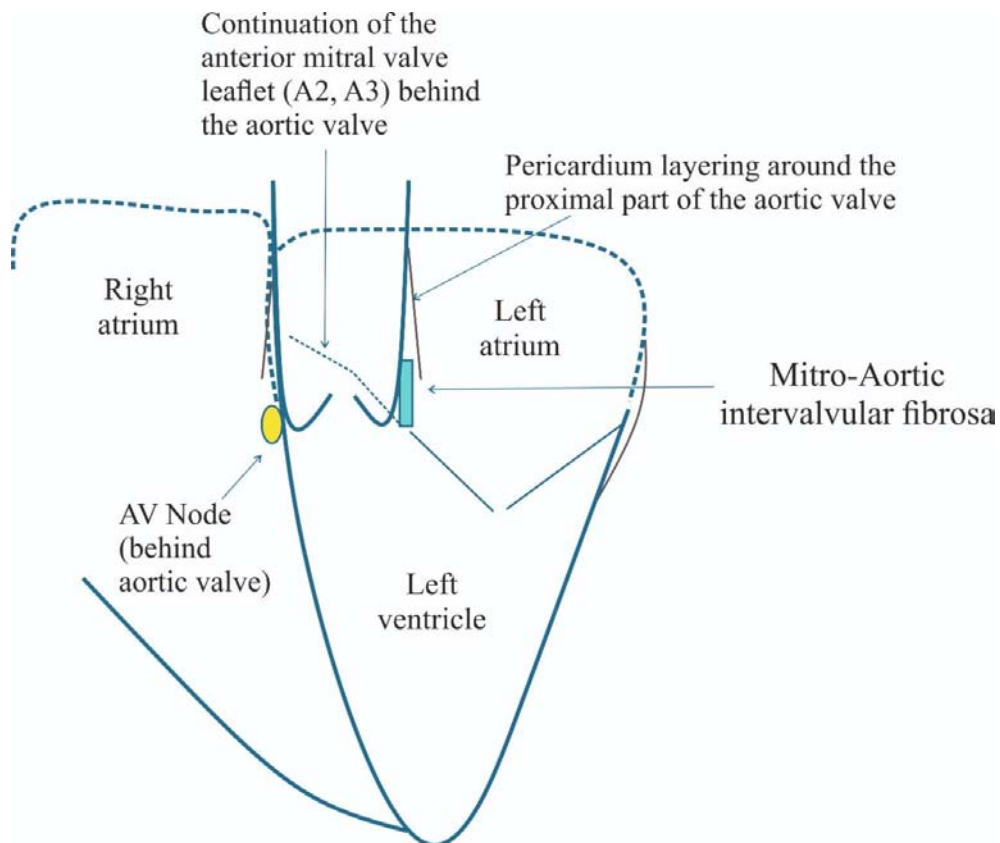


Figure 8. Showing the relation of the AV node to the surrounding anatomy

4. Conclusion

Aortic infective endocarditis is a rare medical condition which could be complicated by aortic root abscess following periannular extension. Early detection and prompt intervention might prevent the complications of the periannular extension. Developing PR prolongation and appearance of LBBB on ECG could be an early sign of aortic root abscess. Serial ECGs and monitoring for ECG signs like PR interval prolongation and appearance of LBBB might be due to aortic root abscess. Prompt recognition will benefit from early surgical intervention.

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