

Aortic Root Abscess with Aorto Annular Fistula, Presenting as a Heart Block in a Patient with Prior Aortic Valve Replacement

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Received: December 22, 2022; **Accepted:** January 07, 2023; **Published:** January 16, 2023

Abstract

Background: Aortic root abscess (ARA) is a well-known complication of aortic valve endocarditis and can affect both the native and prosthetic valves. ARA can commonly present with conduction abnormalities such as heart blocks. The abscess can weaken the aortic wall and lead to development of a pseudoaneurysm with eventual rupture and creation of aorto cavitory fistula (ACF).

Case summary: A 57-year male with a history of aortic valve replacement presented as symptomatic complete heart block. The patient was found to have aortic root abscess and pseudoaneurysm formation, with fistulous connection between aortic annulus and aortic root. Multimodality imaging established the diagnosis followed by complex surgical repair.

Discussion: ARA and ACF is rare and is reported to be present in 5.8% of patients with prosthetic valve and 3.8% in native valve. Prompt diagnosis and treatment of this condition is crucial with the use of multimodality imaging. TEE with color Doppler can help establish the fistulous connection of the abscess cavity with the cardiac chambers. Aortic root ring sign is seen on PET/CT in the presence of ARA. Urgent surgical correction with appropriate antibiotics is needed to prevent further complications.

Keywords: *Aortic root abscess; Prosthetic valve endocarditis; Aortic valve replacement; Multimodality imaging*

1. Introduction

Infective endocarditis (IE) is defined as infection of the endocardial surfaces of the heart and the vast majority are caused by *Staphylococci* or *Streptococci*. Complications associated with IE include perivalvular abscess, conduction abnormalities, heart failure, and strokes. Aortic root abscess (ARA) is a well-known and serious complication of aortic valve endocarditis and can affect both the native and prosthetic valves [1].

Aortic valve involvement is less common compared to mitral valve and it is commonly seen in patients with bicuspid aortic valve, prosthetic valve, or rheumatic heart disease. ARA can commonly present with conduction abnormalities such as heart blocks. The abscess can weaken the aortic wall and lead to development of a pseudoaneurysm with eventual rupture and creation of aorto cavitory fistula (ACF).

2. Case Presentation

A 57-year male presented to the emergency department (ED) with dyspnea on exertion, fatigue, and pre-syncope episodes for few weeks. The patient had congenital aortic valve disease that resulted in four prior cardiac surgical procedures including: 1) aortic valve (AV) valvuloplasty at age 3 years, 2) bioprosthetic aortic valve replacement at age 42, 3) ascending aortic replacement due to aneurysm formation at age 50, and 4) aortic arch aneurysm and a severe prosthetic AV insufficiency leading to AV replacement with a mechanical 23 mm valve and an extended aortic hemi arch with a 30 mm Gelaweave Dacron graft at age 56 years.

His presenting ECG revealed a second degree Mobitz II AV block with an intermittent complete heart block. A limited transthoracic echocardiogram (TTE) showed an ejection fraction of 50%. He underwent permanent pacemaker placement and was discharged home.

Shortly thereafter, the patient presented with fever, and his blood cultures grew coagulase negative staphylococcus epidermidis. A chest CT angiogram revealed increased echo density around the aortic valve prosthesis with a contrast extravasation in a protrusion consistent with a cavity concerning for abscess (FIG. A).

This was followed by a trans-esophageal echocardiogram (TEE) confirming the above finding with extension of the echolucency to the aorto-mitral curtain. A pseudo-aneurysm was seen due to rupture of the sinus of Valsalva and fistula formation with blood entering and exiting the cavity with the cardiac cycle (FIG. D, E). A [¹⁸F] fluorodeoxyglucose (FDG) positron emission tomography/computed tomography showed the soft tissue thickening to be metabolically active, consistent with an abscess (FIG. B, C).

The patient underwent high risk 5th redo sternotomy, reconstruction of the aorto-mitral curtain with bovine pericardium, a 23 mm homograft root replacement, and cabrol coronary ostial extension grafts (FIG. F). At the operation, an acute or chronic peri-root abscess was noted. Tissue cultures were positive for coagulase negative staphylococcus epidermidis. The patient made an uneventful recovery. Vancomycin was continued for 6 weeks.

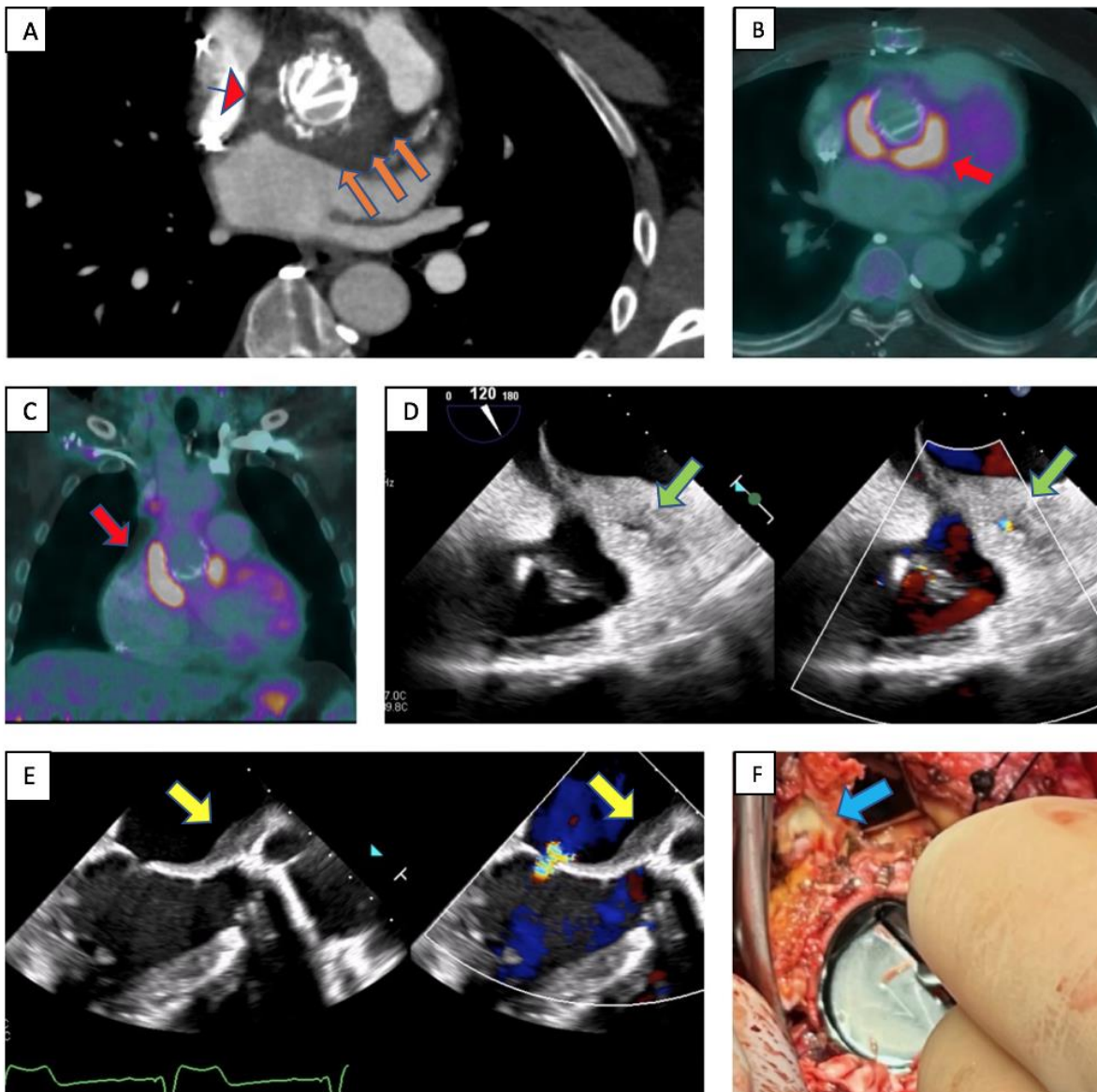


FIG. 1. [Aortic root abscess: (A) CT chest demonstrating ill-defined rim enhancing fluid collection around aortic root indicating an abscess (Orange arrow) and pseudoaneurysm (red arrow head); (B),(C) PET-CT demonstrating phlegmon surrounding the aortic root abscess/ring sign; (D) TEE demonstrating aorto annular fistula filling during systole; (E) TEE demonstrating area of echo-lucency around the valve concerning for aortic root abscess extending to the aorto-mitral curtain; and (F) Intra operative images showing aortic root abscess and On-X valve].

3. Discussion

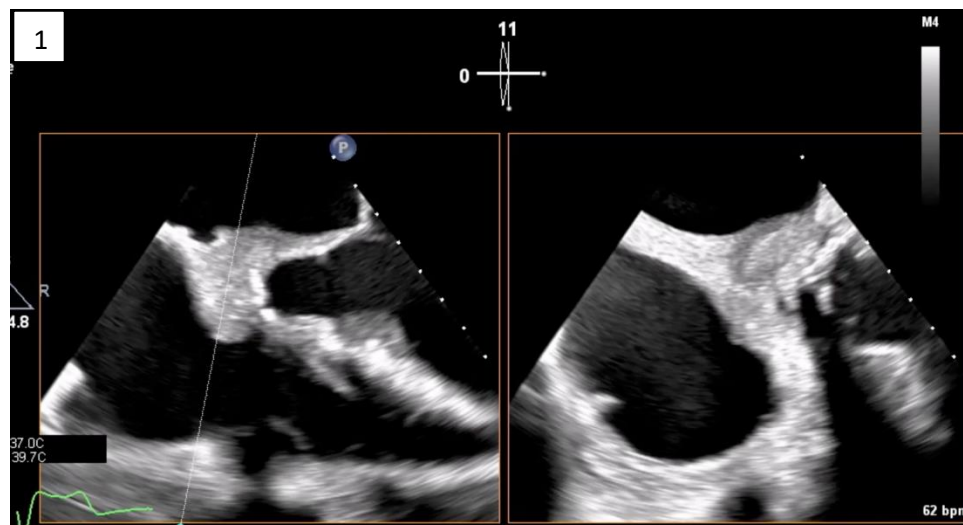
Aortic root abscess (ARA) is a well-known complication of aortic valve endocarditis and can affect both the native and prosthetic valves [1]. The abscess can weaken the aortic wall and lead to development of a pseudoaneurysm with eventual rupture and creation of aorto cavitory fistula (ACF). ACF is rare and is reported to be present in 5.8% of patients with prosthetic valve and 3.8% in native valve [2]. ARA and ACF can affect the conduction system and can cause AV blocks. There can be a delay in diagnosis due to the insidious presentation of ARA and it needs a high degree of clinical suspicion to prevent complications. Prompt diagnosis and treatment of this condition is crucial with the use of multimodality imaging to prevent

complications. Complications such as; burrowing abscess, cardiac fistula, rupture of the abscess, pseudoaneurysm or arrhythmias [2,3] can lead to worse morbidity and mortality and increases the complexity of the surgical procedure. TTE has excellent sensitivity but poor specificity to diagnose ARA and its complications. TEE is far more superior to TTE and is an excellent imaging modality to look at the aortic valve and its surrounding structures. If TTE and TEE is not conclusive for ARA but there is a high clinical suspicion other imaging modalities such as FDG-PET/CT or chest CT could be utilized. PET/CT has been shown to differentiate abscess from other conditions because of the uptake of FDG by the bacterial cells and can demonstrate a characteristic aortic root ring sign in ARA. TEE with color Doppler can help establish the fistulous connection of the abscess cavity with the cardiac chambers and demonstrates the systolic and diastolic flow through the fistula. Antibiotics alone might not be adequate to treat ACF. Urgent surgical debridement of all the infected tissues and appropriate antibiotics with reconstruction of the damages structures with valve replacement is the mainstay of treatment of ARA. Therefore, appropriate utilization of multimodal imaging can lead to accurate diagnosis, management in a timely manner and delineates margins for surgical planning.

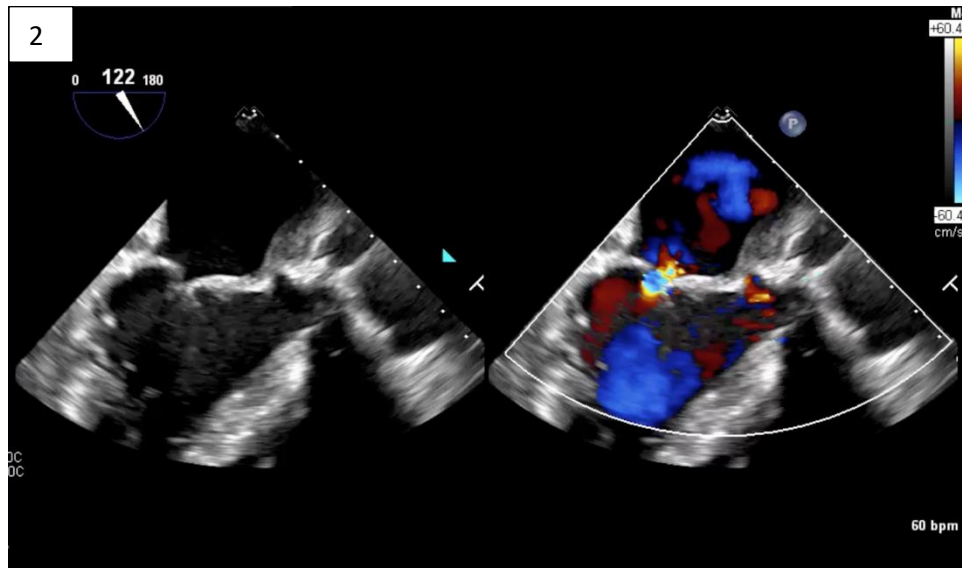
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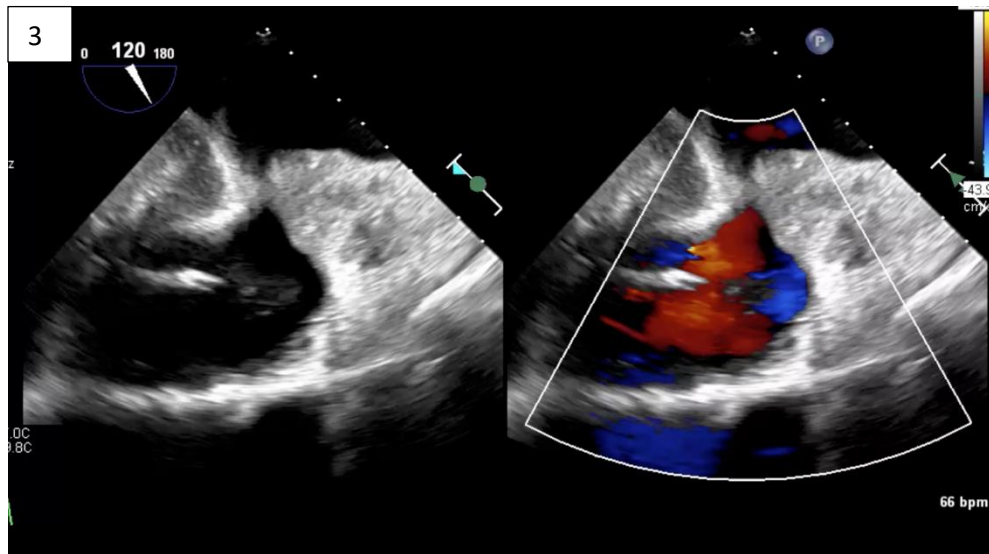
Supplementary Information



1. Pseudo-aneurysm seen on TEE mid esophageal 4 chamber view, suspected due to rupture of the sinus of Valsalva and fistula formation with blood entering and exiting the cavity with the cardiac cycle.



2. TEE mid esophageal LVOT view showing, hypoechoic thickening over the anterior mitral leaflet and aorto-mitral curtain continuing from the aortic root, concerning for abscess.



3. Pseudo-aneurysm seen on TEE mid esophageal bi-caval view, suspected due to rupture of the sinus of Valsalva and fistula formation with blood entering and exiting the cavity with the cardiac cycle.