

The role of multimodality imaging in calcified valves with infective endocarditis

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A 68-years old woman presented with a history of recurrent fever of 38–39° accompanied by chills and weakness over the past month. Her physical examination was unremarkable except for an audible 3/6 ejection murmur at the 2nd right intercostal space. Her vital signs were normal with no fever at presentation. Laboratory tests showed elevated white blood count of 11,800 cells/mm³ with a remarkable neutrophilia and elevated C-reactive protein of 14 mg/dL. Blood glucose, renal and liver function tests were all normal.

Past medical history included asymptomatic severe aortic stenosis, hypertension, hyperlipidemia and fatty liver. During hospitalization several blood cultures were positive for *Streptococcus mitis*, raising a clinical suspicion of infective endocarditis (IE). A fundoscopic examination was performed with no evidence of Roth spots. Urine sediment test was normal. A whole-body computed tomography (CT) scan documented a splenic infarct with mild splenomegaly (Figure 1). To further investigate a suspicion for IE, transesophageal echocardiography

(TEE) was performed showing a severely calcified and stenotic aortic valve but no evidence of valvular vegetations or valvular regurgitation (Figure 2). A second TEE was planned in a week because of the high clinical suspicion of IE. But with ongoing fever and persistent positive blood cultures in the presence of a heavily calcified aortic valve, a cardiac computed tomography angiography (CCTA) was performed revealing a posteriorly located subaortic pseudoaneurysm originating from the left ventricle outflow tract (LVOT) extending towards the left atrium (Figure 3 & Figure 4).

The patient was treated with ceftriaxone. After evaluation by the endocarditis team the diagnosis of IE with perivalvular pseudoaneurysm was formulated and the patient was referred for cardiac surgery. Intraoperatively, a heavily calcified tricuspid aortic valve was observed with an infectious process involving half of the aortic valve annulus between the left and the right cusps and extending into the LVOT creating a large pseudoaneurysm. The aortic valve and the pseudoaneurysm were debrided with all adjacent involved tissue. The defect in the annulus and LVOT was closed with a pericardial patch and a bioprosthetic *Magna Ease #21* valve was implanted. Postoperative TEE demonstrated normal prosthetic valve function and no aortic regurgitation. Postoperatively, a peripherally inserted central catheter (PICC) line was implanted and an antibiogram-guided 6 weeks ceftriaxone therapy was administered. We describe a case of IE complicated by perivalvular pseudoaneurysm in a

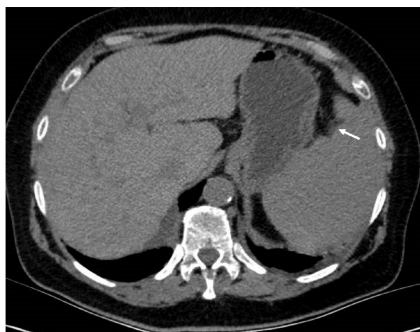


Figure 1 Triangle shaped typical splenic infarct (arrow).

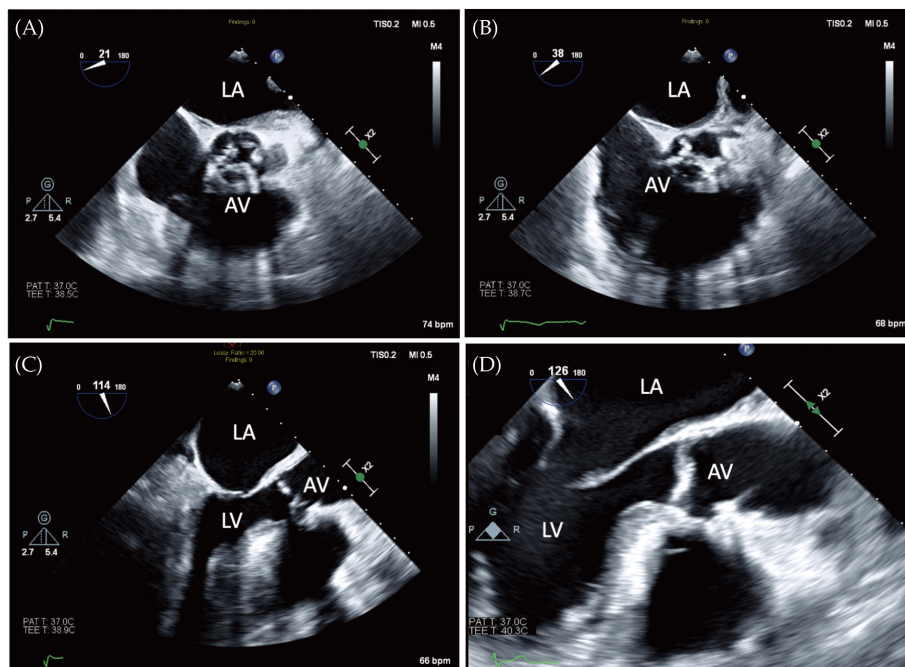


Figure 2 Transesophageal short axis (A, B) and long axis (C, D) systolic (A, C) and diastolic (B, D) frames demonstrating a heavily calcified aortic valve with acoustic shadowing. AV: aortic valve, LA: left ventricle, LV: left ventricle.

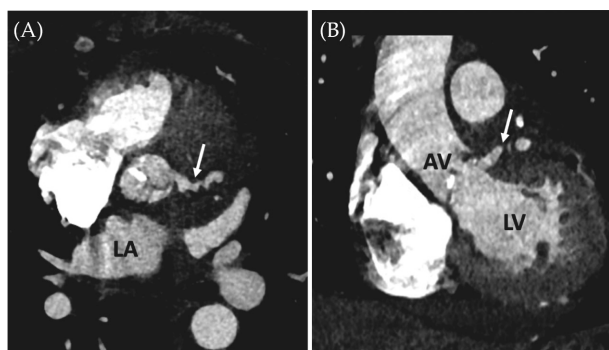


Figure 3 Short axis (A) and long axis (B) cardiac computed tomography slices demonstrating a subaortic pseudoaneurysm originating from the left ventricular outflow tract (arrow). AV: aortic valve, LA: left ventricle, LV: left ventricle.

patient with a severely calcified native aortic valve, emphasizing the role of multimodality imaging in cases of severe valve calcification and high clinical suspicion of IE.

IE is a complex entity with a broad variety of unusual presentations.^[1] While the majority of cases of cardiac pseudoaneurysms are caused by myocardial infarction, the minority are related to endocarditis.^[2,3] Given its low cost and widespread availability, echocardiography represents an important cornerstone in the diagnosis of endocarditis along-

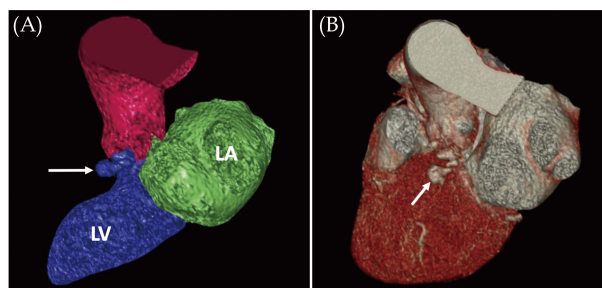


Figure 4 Colored volume rendered (A) and 3-D reconstruction (B) cardiac computed tomography demonstrating the subaortic pseudoaneurysm (arrows). LA: left ventricle, LV: left ventricle.

side microbiologic evaluation.^[1] Indeed, transthoracic echocardiography (TTE) and frequently TEE remain the first line imaging modalities with three main echocardiographic findings that are considered major criteria in the diagnosis of IE: vegetations, abscesses or pseudoaneurysms and new dehiscence of a prosthetic valve as depicted in the current IE guidelines.^[4] However, few data exist regarding the utility of echocardiography in patients with IE and calcified native valves. TEE sensitivity for native valve IE has been reported to be as high as 90%-100%.^[5] However, despite its high sensitivity, a negative TEE examination does not rule out IE. In fact, equivocal findings are not infrequent and



a false negative examinations has been reported in 15% of IE patients.^[6] Emerging data supports the use of CCTA as it represents a valuable tool with a high anatomical accuracy in determining perivalvular involvement in endocarditis.^[7-10] Moreover, CCTA differentiates calcified structures from adjacent tissue more clearly when compared to TEE, because of acoustic shadowing.^[11] Therefore, CCTA has a complementary role in the diagnosis and management of IE in addition to TEE. However, CCTA has a limited diagnostic capacity in patients with small vegetations (< 10 mm), valvular leaflet perforations and perivalvular leaks as compared to TEE.^[12] The atypical presentation of our patient with an initial unremarkable TEE examination reinforces the need for complementary imaging methods such as CCTA to better define perivalvular involvement. In our case CCT was critical in the diagnosis of IE and subaortic involvement, and identifying the locally uncontrolled infection and need for urgent surgery (Figures 3-4). In a small study, the sensitivity and specificity of combined TTE and TEE was 63% and 90%, respectively. CCTA increase sensitivity to 80% by correctly diagnosing all perivalvular pseudoaneurysms.^[10] This supports the recommendation given by current European Society of Cardiology infective endocarditis guidelines in which cardiac magnetic resonance (CMR) and CCTA are indicated to confirm or exclude the diagnosis of IE and to characterize the extent of the cardiac lesions in selected cases.^[4] Limited data exists regarding the natural history of untreated perivalvular pseudoaneurysms. In a multicenter trial evaluating perivalvular extension (PEE) of IE in patients undergoing transcatheter valve implantation, patients with PEE had higher in hospital and 2-year mortality rates.^[12] This emphasizes the importance of early diagnosis prior to extensive tissue destruction which is greatly enhanced by multimodality imaging, particularly in patients with calcified valves.

Post-operatively blood cultures turned negative and the patient was discharged home to an outpatient follow-up setting. The patient was doing well 11 months after discharge. This case demonstrates the utility of multimodality imaging and CCTA in establishing the diagnosis of IE complicated by perivalvular pseudoaneurysm. In cases with extens-

ive valve calcification and a high index of suspicion for IE despite a negative TEE, CCTA is indicated for the diagnosis of IE and to define disease extension, in order to facilitate timely surgery.

Conflicts of interest

None.

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