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Case report

Pseudoaneurysm of the aortic root following aortic valve endocarditis - a case with 2 rare life - threatening complications ☆

Marcello Chiocchi, MD PhD[a], Francesca D'Errico, MD[a,], Vincenzo De Stasio, MD[a], Federica Di Tosto, MD[a], Luca Pugliese, MD[a], Carlo Di Donna, MD[a], Luigi Spiritigliozzi, MD[a], Leonardo Benelli, MD[a], Salvatore Masala, MD PhD[b], Lucrezia Caterino, MD[a,c], Gianluca Vanni, MD PhD[d], Monia Pasqualetto, MD[a], Cecilia Cerimele, MD[a], Francesco Sbordone, MD[a], Francesco Grimaldi, MD[a], Matteo Cesareni, MD[a], Alessandra Luciano, MD[a], Mario Laudazi, MD[a], Carlotta Rellini, MD[a], Martina Cerocchi, MD[a], Paola Leomanni, MD[a], Roberto Floris, MD PhD[a], Francesco Garaci, MD PhD[a]*

[a] *Department of Diagnostic Imaging and Interventional Radiology, University of Tor Vergata, Viale Oxford, 81, Rome 00133, Italy*

[b] *Department of Surgical Science, Policlinico Tor Vergata University, Rome, Italy*

[c] *Policlinico Agostino Gemelli, Rome, Italy*

[d] *Breast Unit, Department of Surgical Science, Policlinico Tor Vergata University, Rome, Italy*

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ABSTRACT

Infective endocarditis can have peri-annular spread and involve the valvular annulus and adjacent cardiac structures, leading to tissue necrosis and peri-annular abscess. This process may cause pseudoaneurysm formation and other rare and potentially life-threatening complications, so their identification and correct diagnosis are crucial.

We describe a case of an 81-year-old woman, with a history of aortic valve replacement and worsening of symptoms, that presents at the imaging a pseudoaneurysm of the aortic root complicated at the same time by 2 life-threatening conditions: fistulization in the Right Ventricular Outflow Tract (RVOT) and the compression of Right Coronary Artery (RCA).

This case underlines the importance of imaging, especially Coronary Computed Tomography Angiography (CCTA), in the diagnosis and follow-up of infective endocarditis and its complications, especially in a patient not eligible for surgery.

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* Corresponding author. F. D'Errico.

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Introduction

Infective endocarditis (IE) is a microbial or mycotic infection of the endocardium, that can involve the valvular annulus and adjacent cardiac structures, with an incidence of 3-10/100.000 person-year [1]. Valve involvement can lead to septic complications such as wall thickening, peri-annular abscess formation, and in rare cases the development of a pseudoaneurysm, most frequently of the mitral-aortic intervalvular fibrosa. It may extend superiorly between the left atrium, ascending aorta, and the pulmonary artery into the pericardial space; laterally, it may expand along the left atrium and the aorta, usually posterior [2].

This may cause rare and potentially life-threatening complications such as compression of the anterior leaflet of the mitral valve and severe mitral regurgitation, rupture into the pericardium resulting in cardiac tamponade, formation of fistulous communication with adjacent structures, compression of proximal coronary arterial segments, and thrombosis with embolic complications [3].

In this case report we describe the case of a patient with a diagnosis of anterior aortic root pseudoaneurysm and 2 severe complications: the presence of a fistula with the Right Ventricular Outflow Tract (RVOT) and the compression of the Right Coronary Artery (RCA).

Case study

An 81-year-old woman, with a known history of aortic valve replacement using a biological prosthesis, arrived at our Emergency Department reporting worsening of symptoms in previous months, with dyspnoea due to light exertion, asthenia, more frequent episodes of extrasystoles, chest pain, and even fever in the last few days.

Laboratory tests showed an increase of troponins, B-type natriuretic peptide (BNP), lactate dehydrogenase (LDH), and PCR. After ruling out an ischemic event by ECG, she was sent to our Department of Cardiovascular disease for further diagnostic workup, even to evaluate the aortic prosthesis.

First of all, she underwent a Transthoracic Echocardiogram (TTE) which resulted non-diagnostic; the following Transesophageal Echocardiography (TEE) showed normally positioned biological aortic valve, with the regular opening of the cusps, and the presence of large periprosthetic abscess anterior to the ventriculo-arterial junction, which opens into the

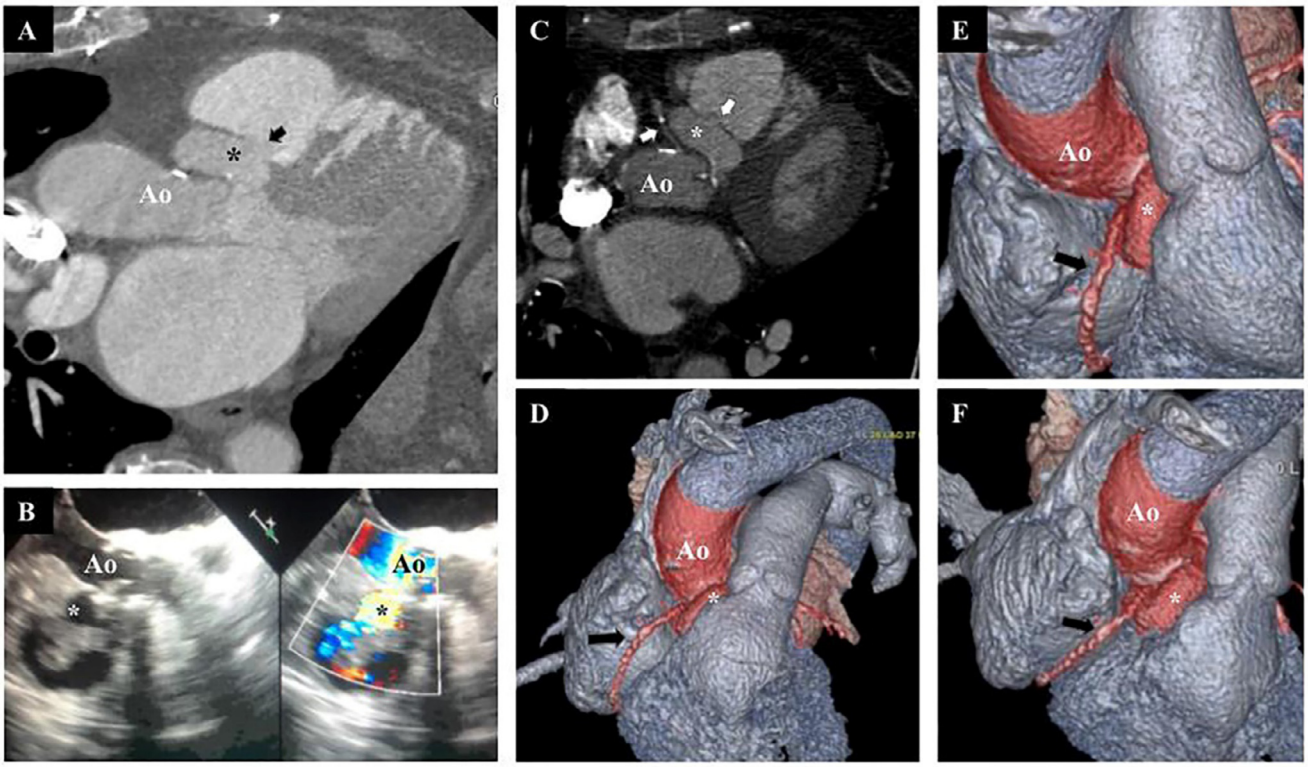

Fig. 1 – Ao: Aorta. Image A: cardiac axial plan, showing the pseudoaneurysm of the aortic root (black star) and the fistula communication with RVOT (black arrow). Image B: Echocardiographic imaging of the fistula (white star) and evidence of the flux through the communication at Doppler evaluation (black star). Image C: Cardiac multiplanar reconstruction highlighting the compression of the right coronary artery (white star) by the pseudoaneurysm (white star). Fistula between RVOT and aneurysm (white arrow). Image D, E, F: 3 different views of Volume Rendering reconstruction showing the compressed right coronary artery (black arrow), the pseudoaneurysm (white star), and proximal aortic tract (Ao).

right ventricle resulting in left-to-right shunt with PAPs 50-60 mm Hg.

To better evaluate the dimensions and the anatomical relations of the structure, a Coronary Computed Tomography Angiography (CCTA) was performed with a 512-slice CT (GE-Healthcare CT Revolution System, General Electric, Milwaukee, WI, USA) using a retrospectively ECG-triggered high-pitch spiral acquisition mode. All the acquired images were transferred to an external workstation (ADW-6,7; GE-Healthcare) for the post-processing analysis. After the non-contrast CT scan, a bolus of non-ionic iso-osmolar contrast agent with an iodine concentration of 400 mg/ml was injected into an antecubital vein of the patient through a 20 gauge catheter using a dual-short injector (Nemoto Kyorindo, Tokyo, Japan) [4–7].

The CCTA and a volume rendering reconstruction confirmed the presence of a pseudo-aneurysmal sac that extended craniocaudally from the aortic sub-valvular plane into the aortopulmonary space. This structure was connected with the RVOT through a centimetric fistula, resulting in a right atrial dilatation. (Fig. 1). Another significant finding was the proximity of the mycotic pseudoaneurysm to the origin of the right coronary artery (RCA) and resultant its compression and stenosis. Due to this last finding, myocardial scintigraphy was performed, and not significant ischemic suffering myocardium was detected in the RCA territory, neither in the other cardiac segments. In addition brain MRI and PET were negative for extracardiac complications for septic emboli.

Appropriate antibiotic therapy has been set and the heart team decided not to intervene surgically due to the patient's age and comorbidities, even considering symptoms stability after medical therapy.

The patient underwent a strict follow-up and after 6 months we performed a PET that did not show pathological uptake of the aortic root (Fig. 2).

Cardiac CT follow-up confirmed the presence of the pseudoaneurysm, the fistula with the RVOT, and the compression of the RCA.

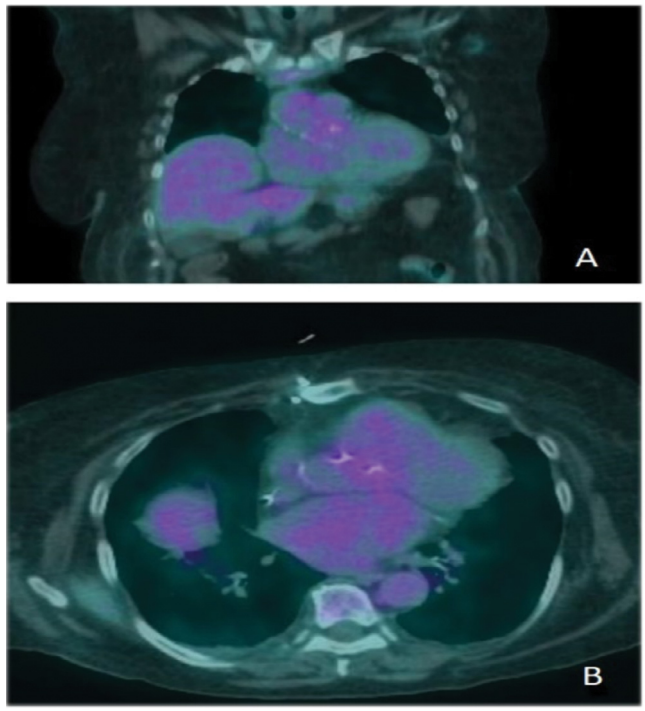

Fig. 2 – (Image A, B) PET images at 6 months follow-up did not show pathological uptake of the aortic root.

Discussion – conclusion

Infective endocarditis is an infection that can have a peri-annular spread, more frequently in the prosthetic aortic valve, since the prosthetic valve annulus is the primary site of infection [1–8]. Tissue necrosis related to pyogenesis may cause peri-annular abscess and pseudoaneurysm formation, more often of the mitral-aortic intervalvular fibrosa [9]. A large pseudoaneurysm can lead to fistulous communication between cardiac chambers or compression of adjacent cardiac structures, such as coronary arteries or ascending aorta. Other rare symptoms may be caused by mechanical obstruction or compression of the conduction system or coronary arteries, which are unusual causes of heart block and ischemia. These rare life-threatening complications must be promptly detected with accurate modalities [10].

These complications are commonly diagnosed by TTE and TEE with a reported sensitivity of 43% and 90%, respectively. Compared with ring abscess, pseudoaneurysm of the valvular annulus is larger, demonstrates color flow on Doppler echocardiography, and exhibits marked pulsatility, expanding in early systole and collapsing in diastole [11].

CCTA can integrate TEE and provides information on complications when TEE is inconclusive [12–13]. The goals of CCTA imaging, when evaluating peri-valvular abscess and the consequent aneurysm, are to confirm the diagnosis, identify the origin and the extent of the lesion, define the relationship with the coronary arteries, detect associated structural anomalies, assess rupture and shunt quantification, and assess other complications, including aortic valve regurgitation and vegetation of IE [10,14–16].

Cine cardiac magnetic resonance imaging could allow precise definition of the location, dimensions, and neck of the pseudoaneurysms, but it is usually not required if other imaging modalities provide an accurate diagnosis, as well as pertinent anatomical and physiological details [17].

Once diagnosed, surgery is the recommended treatment of the pseudoaneurysm to avoid complications. However, it can be technically challenging and is associated with a high risk of morbidity and mortality [14]. Percutaneous closure is a therapeutic alternative, and conservative management has also been sporadically described [18–20].

We reported the case of an 81-years-old female patient presenting at the imaging a pseudoaneurysm of the aortic root, as a complication of prosthetic aortic-valve endocarditis, which was complicated at the same time by 2 rare but life-threatening conditions: fistulization in the RVOT and consequent dilatation of the right atrium, and compression with stenosis of the RCA.

From our literature research, there are some cases of pseudoaneurysm fistulized in the heart chambers [21], but no fur-

ther cases of pseudoaneurysm emerged with either of the 2 described life-threatening complications.

Even if surgery is the recommended treatment of the pseudoaneurysm, Cardiac surgeons have opted for conservative management and close clinical and diagnostic monitoring, because of the high mortality risk due to described complications and even to other preoperative risk factors including the age of the patient. The therapeutic choice was confirmed at follow-up, also considering the reduction of symptoms after appropriate medical therapy.

In this patient, not eligible for surgery, TEE and CCTA are the only resources we have to follow up the evolution of the pseudoaneurysm, of the RCA stenosis and quantify the left-to-right shunt.

Ethics human rights

The authors declare that the work described has been carried out following the Declaration of Helsinki of the World Medical Association revised in 2013 for experiments involving humans.

Patient consent

The authors declare that this report does not contain any personal information that could lead to the identification of the patient. Informed consent was obtained from the patient.

Author contributions

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.

Availability of data and material

Not applicable.

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