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CLINICAL REPORT

Pseudoaneurysm of the mitral-aortic intervalvular fibrosa on a native aortic valve following infective endocarditis

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Abstract Pseudoaneurysm of the mitral-aortic intervalvular fibrosa (MAIVF) rarely forms on native aortic valve after infective endocarditis (IE). It is often fatal because of its rapid progress, high rates of rupture and recurrence, and worsening effects on the systemic condition. Echocardiography, especially transesophageal echocardiography, plays an important role in the diagnosis and assessment of this condition. We experienced a rare case of a patient with an unfortunate course following native aortic valve IE. After the patient had undergone surgical evacuation of a blood clot due to the rupturing of an embolomycotic cerebral aneurysm, a pseudoaneurysm of the MAIVF was found. Aortic valve replacement and pseudoaneurysm repair were performed 3 months after the neurosurgery. Echocardiographic still images were obtained during these two operations.

Keywords Pseudoaneurysm · Infective endocarditis · Native aortic valve

Introduction

Pseudoaneurysm of the left ventricular outflow tract is a rare complication associated with infective endocarditis (IE). Once a pseudoaneurysm forms, it is very unstable and imposes the risk of rupture, which leads to cardiac disruption by pericardial tamponade, an eccentric jet causing severe mitral regurgitation, or a fistula connecting the left ventricle to the ascending aorta [1–3]. All of these conditions carry high morbidity and mortality [4, 5]. It is therefore important to diagnose this complication and to institute an appropriate surgical intervention. Few cases of the formation of such an aneurysm have been reported for a native aortic valve after IE. We encountered a patient with a native aortic valve who presented a false aneurysm of the mitral-aortic intervalvular fibrosa (MAIVF) during the course of IE treatment.

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Case description

A 24 year-old male with no medical history visited his primary care physician complaining of general fatigue and a fever of over 40°C. He was febrile and appeared septic. He had undergone a dental procedure about 10 weeks before his visit and had 7 weeks of low-grade fever. His primary care physician suspected bacteremia caused by the previous dental procedure and admitted him for antibiotic treatment. Subsequent blood cultures revealed a *Streptococcus* species. However, 3 weeks after the first administration of antibiotics the patient still had persistent fever, and he was eventually transferred to our hospital for further scrutiny. On arrival, his vital signs were stable and he showed no sign of distress. Physical examination revealed a Grade II/IV diastolic murmur at the second intercostal space. No skin lesion was noted and extremities did not show any peripheral edema. Laboratory examination appeared normal except for a slightly elevated white blood cell (WBC) count of 9,100/mm^3 and a C-reactive protein (CRP) of 1.21 mg/dl. Abdominal ultrasound examination revealed mild splenomegaly. Transthoracic echocardiography (TTE) revealed congenital bicuspid aortic valve, Grade II aortic valve regurgitation, vegetation on the noncoronary cusp of the aortic valve and on the anterior

mitral valve leaflet, and abscess in the region of the MAIVF. Left ventricular function was within normal limits. There was no pericardial effusion. The patient was diagnosed with aortic regurgitation resulting from IE.

Intravenous penicillin G 18 MU/day and gentamicin 180 mg/day were started, resulting in an improvement in the bacterial endocarditis. Thirty-three days after admission, the patient suddenly collapsed. Computed tomography (CT) showed subcortical hemorrhage on the left parietal and temporal lobes. Surgical evacuation of the blood clot was conducted immediately for brain decompression. Rupture of an embolomycotic cerebral aneurysm following IE was suspected; however, cultures of the resected tissue and hematoma were negative. During the neurosurgery, we conducted transesophageal echocardiography (TEE) and found a 24 × 13 mm aneurysm in the region of the MAIVF. No vegetation was observed on the aortic or mitral valve. Aortic valve regurgitation progressed to Grade III.

About 3 months after the neurosurgery, an aortic valve replacement was performed. Intraoperative TEE examination revealed a pulsatile 34 × 20 mm cavity in the MAIVF close to the noncoronary cusp of a bicuspid aortic valve in the mid-esophageal long-axis view. Systolic expansion and diastolic collapse were observed within the area of the MAIVF (Fig. 1). An aortic regurgitant jet into the cavity was evident using color flow Doppler (Fig. 2). The defect measured 8 mm across. No sign of a rupture of the lesion to the aorta or the left atrium was found. No vegetation was found on either the aortic or the mitral valve, or in the pseudoaneurysm.

Visual inspection of the aortic valve and the cavity showed no vegetation or infective tissue (Fig. 3). The surgeons directly closed the pseudoaneurysm. The bicuspid aortic valve was excised and replaced with a prosthetic aortic valve (SJM Regent® Valve 21 mm). TEE showed a significant reduction in the flow in the cavity after replacement.

His postoperative course was uneventful. A subsequent TTE study showed no residual cavity. No bacteria were detected in the tissue of the aortic valve. Blood cultures were sterile throughout his hospital stay. The patient still has right hemiplegia and Broca's aphasia and is currently undergoing rehabilitation.

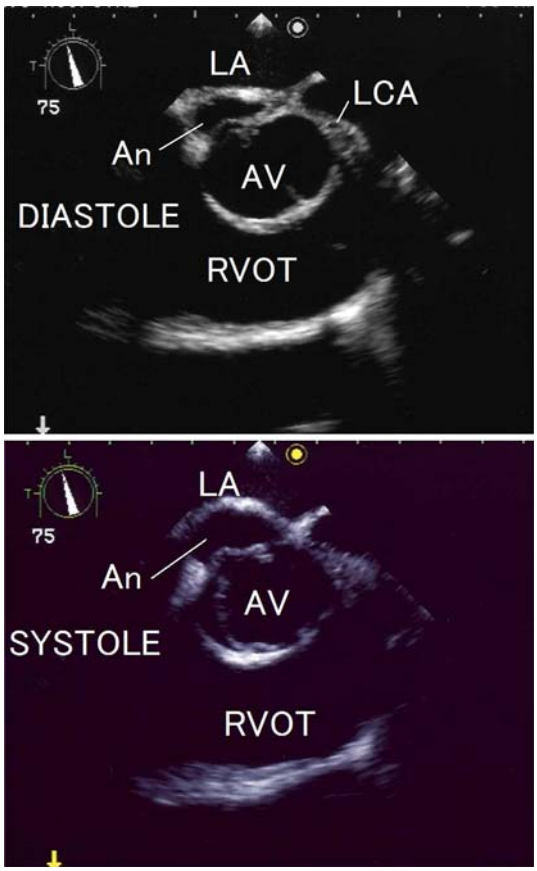

Fig. 1 Systolic expansion and diastolic collapse were observed within the area of the MAIVF. *An* pseudoaneurysm, *AV* aortic valve, *LA* left atrium, *LCA* left coronary artery, *RVOT* right ventricle outflow tract

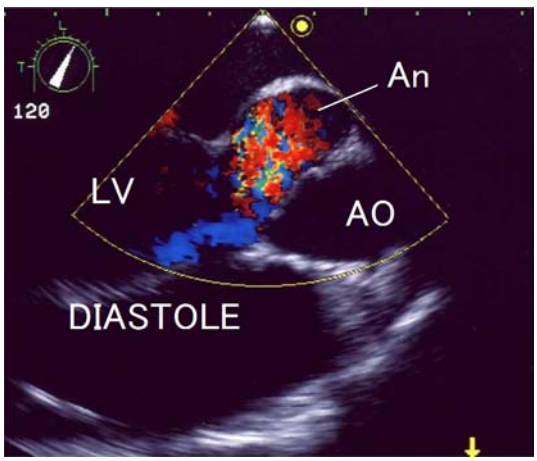

Fig. 2 An aortic regurgitant jet into the cavity was evident using color flow Doppler. *AO* aorta, *LV* left ventricle

Discussion

Pseudoaneurysms of the MAIVF are known to occur after myocardial infarction, infective aortic endocarditis, aortic valve replacement surgery, and blunt chest trauma, but are relatively rare complications [1, 6].

The MAIVF, a fibrous structure constituting the base of the aortic valve cusps, connects the left half of the non-coronary cusp to the adjacent third of the left coronary cusp and ends at the anterior portion of the mitral valve leaflet (Fig. 4). Normally, this zone is the only portion of the aortic wall that does not face the ventricle. The

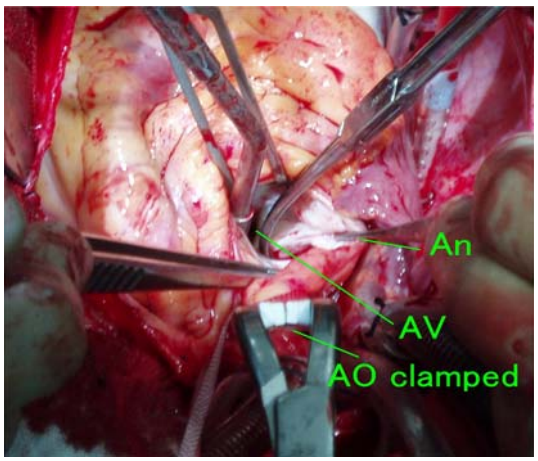

Fig. 3 Visual inspection of the aortic valve and the cavity. The operator is grasping the pseudoaneurysm with forceps

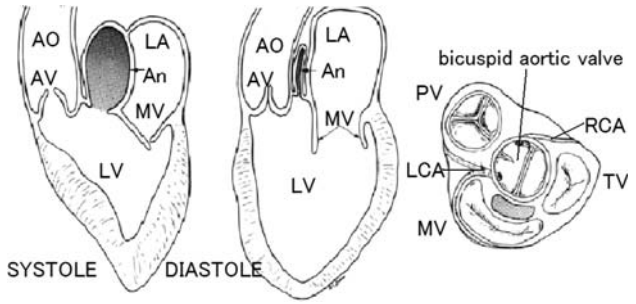

Fig. 4 The location of the pseudoaneurysm of the MAIVF. *TV* tricuspid valve. *PV* pulmonary valve. *MV* mitral valve. *RCA* right coronary artery

epicardium and the epicardial fat cover the surface of the MAIVF and separate the outflow tract of the left ventricle from the pericardial cavity. Because the MAIVF is relatively avascular, it has less resistance to infection than other parts of the heart have. On the other hand, an infected aortic regurgitant jet can strike the subvalvular structures, contributing to the formation of pseudoaneurysms. In addition, several studies have reported that the fibrous tissue of the MAIVF in the congenital bicuspid aortic valve was larger than that seen in normal subjects [7, 8].

Periannular extension is common, occurring in 10–40% of all native valve IE cases and in 56–100% of prosthetic valve IE cases. Abscesses are more common than pseudoaneurysms [4, 9, 10]. Abscesses may progress to pseudoaneurysms under the influence of systemic intravascular pressures. It is not known exactly how often the pseudoaneurysms occur, but they are rarely reported. Once a pseudoaneurysm develops, it is prone to rupture. Such a rupture may occur in the pericardium, resulting in cardiac tamponade; in the left atrium, resulting in an eccentric jet of mitral regurgitation; or in the aorta, resulting in a fistula connecting the left ventricle to the ascending aorta. All of these conditions are catastrophic. Patients with a periannular extension of infection require urgent surgical intervention. It is important to institute appropriate surgical treatment in a timely fashion to decrease the risks of morbidity and mortality. Therefore, echocardiographers should distinguish pseudoaneurysms or fistulae from unruptured abscess cavities preoperatively. TEE can demonstrate continuous systolic and diastolic flow into and out from pseudoaneurysms with color flow Doppler, but abscesses are smaller and nonpulsatile [1, 2].

Intraoperatively, we anesthesiologists should assess not only the obvious dysfunctional valve but also the other valves and contiguous structures, which may include pseudoaneurysms. Post-cardiopulmonary bypass images should confirm the adequacy of the repair or replacement and document the successful closure of pseudoaneurysms or fistulae.

In the present case, TTE revealed an abscess in the region of the MAIVF on the day of admission, and the patient was started on antibiotics. Early in the treatment course of antibiotic therapy, he suffered from intracranial hemorrhage due to the rupture of an embolomycotic cerebral aneurysm, and TEE revealed the pseudoaneurysm of the MAIVF. Pseudoaneurysm and persistent vegetation after systemic embolization are factors indicating a need to consider surgical intervention. Aortic valve replacement and MAIVF abnormality repairment were performed, and we confirmed adequate valve replacement and successful closure of the pseudoaneurysm.

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