Large left ventricular pseudoaneurysm

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Left ventricular pseudoaneurysm (LVPA) can complicate 4\% of myocardial infarction; it forms when rupture of the myocardium is contained by adherent pericardium or scar tissue. The diagnosis of a LVPA can be very difficult because of nonspecific signs and symptoms. Transthoracic two-dimensional echocardiography (TTE) is the first applied investigation, although often can be non-diagnostic. TTE, contrast ventriculography, cardiac magnetic resonance (CMR) and three-dimensional echocardiography (3DE) are useful tools in pre-surgical assessment, allowing the differentiation between LV aneurysm and pseudoaneurysm, and the evaluation of LVPA size and spatial distribution. We report a case of a patient with a post-infarction LVPA that was detected initially by TTE and then confirmed by ventriculography, 3DE and CMR. The patient was successfully treated surgically and then monitored by TTE.

A 54 years-old patient was admitted in our hospital for dyspnea, orthopnea and paroxysmal nocturnal dyspnea, after an episode of epigastrical pain, for the duration of a few minutes, approximately three months before. Physical examination showed dullness on percussion and decreased breath sounds at the right lung base suggesting pleural effusion. The patient’s risks for coronary artery disease hypertension (treated with enalapril), smoking and drank alcohol generously. The electrocardiogram showed Q waves in leads II, III, aVF, V5 e V6 (Figure 1). Chest X-ray indicated signs of pulmonary congestion. TTE showed left ventricular dilation and a suspected pseudo-aneurysmatic enlargement in the lateral and infero-lateral wall with thrombotic stratification (Figure 2), severely reduced LV function, moderate dilation of left atrium, severe mitral regurgitation, but no evidence for raised pulmonary artery pressure.

After clinical stabilization coronary angiography showed sub-total occlusion of the circumflex artery and sub-critical stenosis (< 80\%) of the posterior interventricular artery. Ventriculography showed apical and anterior akinesis, a depressed left ventricular ejection fraction (20\%) and a wide dilation of LV. 3DE and CMR were performed to clarify the nature and the shape of the LV dilation before cardiac surgery. 3DE showed the suspected pseudoaneurysmsal dilation communicating with LV by a neck involving the antero-lateral and infero-lateral segments of mid-basal portion of LV, and it offered also a surgical anatomic view in short-axis at the level of the mitral valve (Figure 3). A CMR was necessary to differentiate between true and false left ventricular aneurysm: it showed a neck (6x4 cm) connecting the LV to a voluminous aneurysmal sac (8x9x6cm) with a very thin wall that lost continuity in posterior and superior-posterior pole, suggesting a pseudoaneurysmal dilation; there was also evidence for a small thrombotic formation at the peripheral regions of the LVPA (Figure 4, Figure 5).

Subsequently, the patient was treated with cardio-surgical intervention: ventriculoplasty was performed using a Dacron patch, to close the neck after the removal of the pseudo-aneurysmal sac, followed by a mitral valve repair with a St. Jude Medical Rigid Saddle Ring. The pseudo-aneurysmal sac had the larger diameter of 8 cm, and the neck was shaped also from posterior mitral annulus (Figure 6). After 5 days of intensive care, the patient was transferred to the cardiology ward with good O2 saturation in spontaneous breathing, and a good haemodynamic compensation.

Figure 1: Twelve-leads ECG at the time of admission. Note Q waves in leads II, III, aVF, V5, V6 and bi-atrial abnormality.
The post-surgical course was uneventful and without arrhythmias; a chest x-ray showed a moderate bilateral pleural effusion; TTE showed a mild pericardial effusion, increased LV diameters and volumes, the patch in medio-basal and lateral wall with no residual leak, residual mild mitral regurgitation, a depressed left ventricular ejection fraction (25%) with akinetic lateral wall and true apex. The patient was discharged 20 days after surgery on conventional medical therapy.

**Discussion**

Diagnosis of pseudo-aneurysms can be very difficult, sometimes accidental, because they present with nonspecific signs and symptom. LVPA should be diagnosed by several imaging techniques, including TTE, contrast ventriculography, coronary angiography, CMR, 3DE. The principal feature is the typical narrow neck connecting the aneurysmal sac with the left ventricle; in most cases, the maximal internal width of the orifice is less than the maximal internal diameter of the aneurysmal sac (ratio < 1), unlike true aneurysm, where the ratio is usually >1². Another important feature of LVPA is the loss of continuity in the myocardium, difficult to detect, especially in the presence of a thrombus formation in the wall of the aneurysmal sac³.

Although TTE is usually non-diagnostic, it is a reasonable non-invasive first test to detect ventricular dilation and dysfunction⁴, it also plays an important role in the follow-up after surgery⁵. Contrast ventriculography and coronary angiography have been the standard technique for diagnosing LVPA over a long period of time, and they are necessary pre-surgical diagnostic tools yet⁶. In confirming the echo findings, ventriculography can show the narrow neck and the position of LVPA, quantify
the degree of mitral functional regurgitation, the left ventricular ejection fraction, and the extent of pulmonary hypertension; coronary angiography provides information on the degree of coronary artery disease and the lack of coronary artery surrounding the pseudo-aneurysmal sac. CMR is currently considered the reference technique for left ventricle size and function measurements, and previous case reports in literature indicate that it may play an important role in differentiating between true and false left ventricular aneurysms with more certainty than other imaging techniques5.

Unlike TTE, 3DE doesn’t require geometric assumption and can provide accurate assessment of ventricular size and function also in left ventricles with asymmetrical shape6. In addition, 3DE may provide surgical views of the culprit lesion. Some studies indicate that 3D can accurately reconstruct aneurysmal left ventricles and can provide separate aneurysm and residual LV body volumes to assess the physiological impact in the function of the non-aneurysmal LV; this would provide pre-surgical information about patch size and make it possible to calculate the actual ventricular size, shape and function after aneurysmectomy7. The benefit of 3D imaging in LVPA has been shown in many reports8,9.

Untreated LVPA have approximately 30-40% risk of rupture and a poor prognosis, therefore surgical correction is usually mandatory10. Differentiating left ventricle pseudoaneurysm from true aneurysm is very important for patient’s management; in fact, true aneurysms have to be treated surgically only when the medical therapy is considered insufficient. The surgical intervention consists of removing the pseudoaneurysmal sac and closing the neck directly, if fibrotic edges are present, or with a synthetic or pericardial patch. Concomitant myocardial revascularization and correction of associated mitral valve regurgitation could complement ventricular repair.

The pseudoaneurysm of this case was detected accidentally by TTE, because of heart failure signs and symptoms, due to an unrecognized myocardial infarction occurred months before presentation. Pre-surgical assessment included TTE, contrast ventriculography, coronary angiography, CMR and 3DE. The latter allowed the best evaluation of the location and shape of the LVPA, compared to TTE, and it provided surgical views of pseudoaneurysmal dilation. CMR consented the final diagnosis of LVPA, and allowed to obtain accurate measurements of the LVPA size.

References
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