Left Ventricular Aneurysm With Contained Rupture

Priscila Nasser de Carvalho,[1] *Mariane Higa Shinzato,*[2] *Roberto Tadeu Magro Kroll,*[2] *Andrea Cunha Cortellazzi,*[1] *Aloysio Abdo Silva Campos*[2]

Hospital de Transplantes do Estado de São Paulo Euryclides de Jesus Zerbini,[1] *São Paulo, SP – Brazil*
Instituto Dante Pazzanese de Cardiologia,[2] *São Paulo, SP – Brazil*

Introduction

Left ventricular aneurysms (LVA) and left ventricular pseudoaneurysms (LVPA) are serious complications resulting from transmural myocardial infarction. Their incidence has decreased considerably with the advancements of interventional cardiology, using early revascularization of the compromised coronary artery, preventing ventricular remodeling.[1] Differential diagnosis is often not easy; however, it must be made early.

An LVA occurs months or years after acute myocardial infarction. It is formed by an area of scar tissue and contains the three layers of the ventricular wall (endocardium, myocardium, and pericardium). Its wall is preserved and may contain thrombi. An LVPA is a rare complication that can occur days or months after the infarction. It is formed by the weakened wall that ruptures after the infarction, in a way that this rupture is contained by the pericardium, resulting in discontinuity of the endocardial border.[2] Usually, an LVA is located in the apical and anterior regions, while an LVPA is located in the posterolateral region of the left ventricle.[3]

Surgical resection of an LVA is necessary in cases of refractory angina, heart failure, systemic embolization, and refractory arrhythmia.[2,3] A pseudoaneurysm has a high risk of rupture (30% to 45%) and sudden death due to cardiac tamponade. Therefore, surgical treatment is recommended immediately after detection.[4,5]

Rupture of a true left ventricular aneurysm in the chronic phase is an uncommon phenomenon.[2] The purpose of this study was to report the case of a patient with a ruptured left ventricular aneurysm, developing chest pain and needing heart surgery.

Case report

Male patient, 70 years old, hypertensive, diabetic, dyslipidemic, and former smoker. He experienced an acute myocardial infarction with ST-segment elevation of the anterior wall, undergoing angioplasty of the anterior descending artery in July 2022. In September 2022, he was admitted to the emergency department of a general hospital with ventilator-depending chest pain and dyspnea. Physical examination revealed that his condition was hemodynamically stable.

Due to the presence of a massive pleural effusion on the left side, as detected on the chest X-ray, a relief thoracentesis was performed, removing 1000 ml of serum and blood-stained fluid. Subsequently, a computed tomography scan of the chest was performed, which revealed the partial collapse of the left lung due to massive pleural effusion, in addition to a small pleural effusion on the right and sacculation of the left ventricle, with foci of gas present in contiguity with the apex, suggesting a contained ruptured aneurysm in the left ventricle (Figures 1 and 2). On the transthoracic echocardiogram (Figure 3), a large aneurysmal image can be seen in the apical region of the left ventricle with mobile formations, suggesting the presence of a thrombus, contiguous with the pericardial sac, in addition to apical dyskinesia, hypokinesia of the anterior wall, and significant left ventricular dysfunction.

Surgical correction was recommended. The patient was transferred to a tertiary hospital, where he underwent left ventricular reconstruction and thrombectomy (Figure 4). Postoperatively, the patient developed several complications, including cardiogenic and vasoplegic shock, requiring the use of vasoactive drugs and an intra-aortic balloon pump. After being hospitalized for months, he was discharged from the hospital for rehabilitation.

Discussion

Ventricular aneurysms contain a narrowed area in a scarred region of the myocardium that has a dyskinetic movement. Most of the time, they result from occlusion of the anterior descending artery in cases where there is no well-developed collateral circulation.[1] They occur due to intraventricular pressure that leads to the expansion of the necrotic area of the infarction.[4,6] Patients are generally asymptomatic and this condition is often found during a routine transthoracic echocardiogram (TTE).[1]

The TTE has good sensitivity and specificity for the diagnosis of LVA.[1] The thinner wall of the infarct region communicates with the ventricle through a wide neck, unlike the pseudoaneurysm, in which this neck is narrow. However, the differential diagnosis between the two can be difficult, especially when they are located posteriorly.[6,7]

A Chest Computed Tomography **Angiography** not only confirms the echocardiographic findings, but also

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Mailing Address: Priscila Nasser de Carvalho •
Hospital de Transplantes do Estado de São Paulo Euryclides de Jesus Zerbini, Cardiologia. Avenida Brigadeiro Luís Antônio, 2651. Postal code: 01401-000. São Paulo, SP – Brazil
E-mail: priscilanasser@yahoo.com.br
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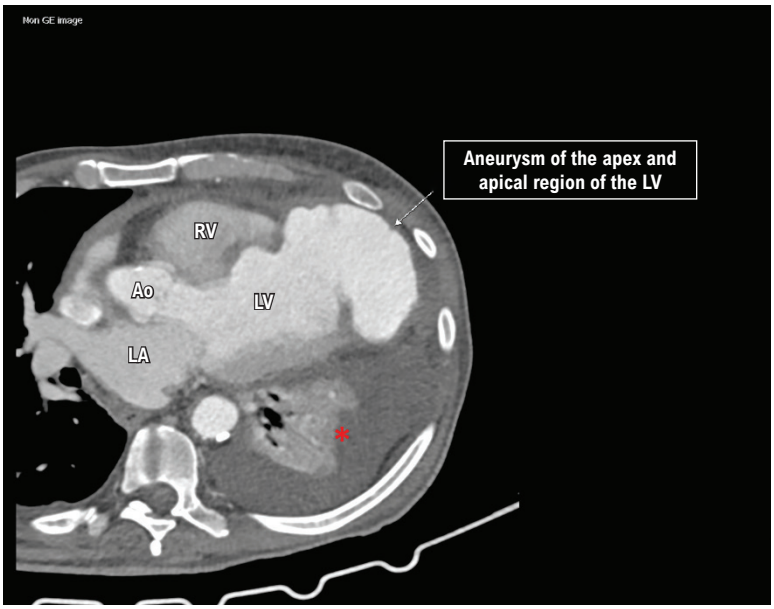

Figure 1 – *Three-chamber long-axis tomographic image (left ventricular outflow tract) showing aneurysm of the left ventricular apex (white arrow). Pleural effusion on the left with compressive atelectasis (red asterisk) is also noted.*

Figure 2 – *Two-chamber long-axis tomographic image showing partially thrombosed aneurysm of the left ventricular apex (yellow asterisk and white arrow)*

allows a very accurate description of the anatomy of the left ventricle. The thin wall thickness, the anatomical characteristics (regular expansion of the cavity and the pericardium surrounding the myocardial scar), and the absence of discontinuity in the endocardial wall are characteristic signs of LVA.[2] Due to its better spatial resolution, Cardiac Computed Tomography helps visualize segments that are difficult to evaluate by TTE.[1] By allowing tissue characterization, magnetic resonance imaging of the heart is the right exam to distinguish LVA from LVPA,[1] which is highly valued since it allows the assessment of size and location.[2]

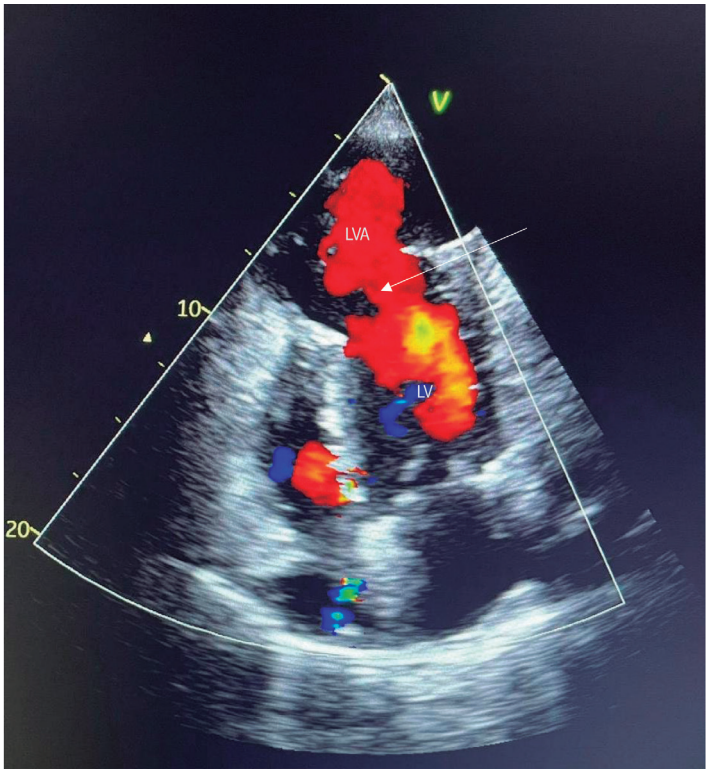

Figura 3 – *Transthoracic echocardiogram with a four-chamber apical view showing the communication of the intact wall of the left ventricle with the cystic cavity through a wide lap (white arrow). LVA: Left Ventricle Aneurysm; LV: Left Ventricle.*

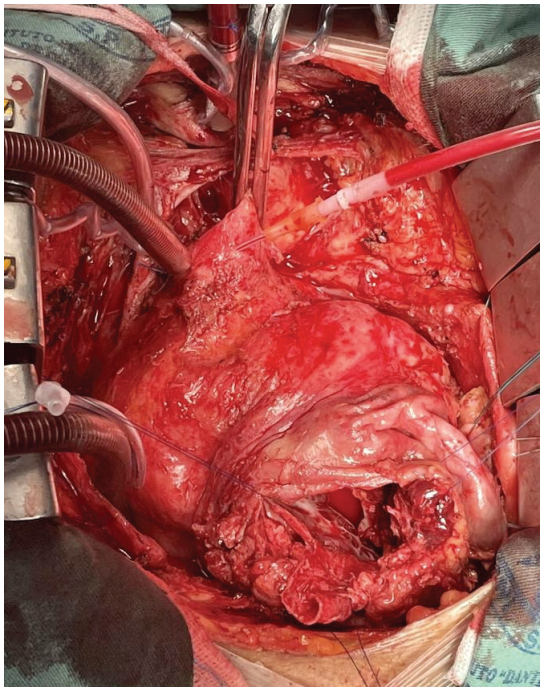

Figure 4 – *Intraoperative image showing ruptured left ventricular aneurysm*

Preoperative left ventricular ejection fraction (LVEF) is an important determinant of survival. Patients with a left ventricular ejection fraction (LVEF) < 30% have a much lower survival rate than those with LVEF > 30%.[4]

Surgical intervention is intended to improve left ventricular function and reverse remodeling, reducing the likelihood of malignant arrhythmias and embolic events.[6,7] Surgical correction of an LVA consists of an aneurysmectomy and ventricular reconstruction with a patch, implantation of an arterial graft when necessary, and correction of other mechanical complications, such as mitral insufficiency.[1]

The early diagnosis of LVA or LVPA is key for establishing the right treatment at the right time and avoiding even greater complications.

Author Contributions

Conception and design of the research and writing of the manuscript: Carvalho PN, Shinzato MH; acquisition of data:_Carvalho PN, Shinzato MH, Kroll RTM, Cortelazzi AC, Campos AAS; analysis and interpretation of the data:_Kroll RTM; critical revision of the manuscript for intellectual content: Carvalho PN, Shinzato MH,_Kroll RTM; tomography images: Shinzato MH; echocardiogram image (Figure 3): Cortelazzi AC; intraoperative image: Campos AAS.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Hospital Brigadeiro UGA V – SP under the protocol number 6/80705. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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