An unusual complication of myocardial infarction

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Abstract

Despite medical and interventional advances, the mechanical complications of acute myocardial infarction are associated with high mortality. Timely surgical therapy requires a prompt and accurate diagnosis. Multimodality imaging has become the standard of care in modern cardiology. Despite the widespread use and cost-effectiveness of cardiac ultrasound in the acute setting, the method is highly user-dependent. In complex cases a second imaging technique is often required. The case presents the key role of multimodal imaging in the evaluation of a patient with a very rare complication of an acute myocardial infarction, a pseudoaneurysm of the interventricular septum respectively. In addition to confirming the diagnosis assumed by echocardiography, cardiac computed tomography provides additional structural and functional information essential to proper management.

Keywords: pseudoaneurism; myocardial infarction; multimodality imaging

Introduction

Mechanical complications after an acute myocardial infarction are associated with the worst clinical outcomes. Despite the fact that the widespread use of percutaneous coronary interventions in the acute setting has significantly reduced their incidence, the rupture of either papillary muscles or cardiac walls continues to be responsible for a significant number of deaths. Early and accurate imaging diagnosis is essential for timely therapy [1-5]. Echocardiography proved its effectiveness in the emergency room and became the first option in the acute setting. However, in a number of cases a second imaging technique is required, highlighting the role of multimodal imaging in modern cardiology [6].

Case report

We report the case of a 72-year-old man with repetitive strokes, permanent atrial fibrillation and post thrombotic syndrome of the lower left limb, which was referred for breathlessness. From heteroanamnesis, it resulted that the patient had experienced severe chest pain of long duration (several hours) 3 weeks before hospitalization.

Physical examination found basal inspiratory crackles, irregular heart sounds with systolic murmur in the mitral area, blood pressure=160/90mmHg, heart rate=100bpm. Electrocardiogram (ECG) showed atrial fibrillation, left QRS axis deviation and frequent premature ventricular contractions. Blood test identified high levels of troponin T, Lactate Dehydrogenase (LDH) and N-terminal proB-type natriuretic peptide (NT proBNP). Chest X-ray found pulmonary stasis and bilateral moderate pleural effusion.

Echocardiography found a mildly dilated left ventricle with moderately reduced left ventricular ejection fraction (LVEF=33%) and right ventricular dilation with systolic dysfunction. Moreover, a contained discontinuity with narrow neck at the base of the posterior interventricular septum without left-to-right shunt (consistent
An unusual complication of myocardial infarction (with a pseudoaneurysm) was found. Additionally, the patient presented severe mitral regurgitation, moderate tricuspid regurgitation and pulmonary hypertension (fig 1). Cardiac computed tomography (CT) confirmed the diagnosis of septal pseudoaneurysm and found occlusion of the proximal left anterior descendent and severe stenosis in the middle segment of the right coronary artery (fig 2).

The case was discussed by the Heart Team and the patient was offered a coronary angiography, followed by surgical revascularization and correction of both cardiac defect and mitral regurgitation. Both the patient and the family refused any invasive intervention. After 6 days of hospitalization, the patient was discharged without symptoms at rest. Guideline heart failure therapy [7] and a direct oral anticoagulant were recommended.

Discussion

Cardiac imaging plays a key role in the early diagnosis of mechanical complications after acute myocardial infarction. The wide availability and harmlessness have made transthoracic echocardiography the first line imaging option in the acute cardiac setting. In patients with critical conditions, such as those with acute heart failure and hemodynamic instability, it may be the only imaging method needed. However, in selected cases, a transesophageal approach is required to establish the diagnosis. Depending on local availability, in stable patients, the current recommendations are to use a second imaging modality, with a higher spatial resolution, such as CT or magnetic resonance imaging (MRI). In addition to the evaluation of the cardiac structures, it allows a non-invasive assessment of coronary arteries. The chosen method depends on local availability and patient characteristics [1,6].

Our case illustrates a patient with severe right middle coronary artery (RCA) stenosis and proximal left anterior descending artery (LAD) occlusion. The former lesion led to a septal ventricular pseudoaneurysm, while the latter was not followed by any mechanical complications. This may be due to a progressive occlusion of the LAD, allowing the development of collateral circulation. The RCA lesion probably developed on a damaged myocardium resulting in a rare complication of myocardial infarction, a pseudoaneurysm of the basal interventricular septum. Progression to complete rupture of the interventricular septum may be hindered by the nontransmural nature of myocardial infarction due to low blood flow through RCA.

Fig 1. Echocardiographic examination. Interventricular septum pseudoaneurism (arrows): a) 2D parasternal short axis view; b) 2D apical 4 chambers view; c) interventricular septum pseudoaneurism – no left-to-right shunt; d) severe mitral regurgitation.

Fig 2. Cardiac Computed Tomography: a) interventricular septum pseudoaneurism (arrow) - short axis view; b) interventricular septum pseudoaneurism (arrow) - long axis view; c) Computed Tomography coronary angiogram (LAD- Left anterior descendent; CX- Circumflex artery; RC- Right coronary) – extensive coronary disease (Calcium score=1813 Hounsfield Units).
Pseudoaneurysms are usually located in the inferior and postero-lateral walls, where the local pericardium acts as a natural patch, covering the myocardial breach. Rupture of myocardial fibers in the interventricular septum usually results in a ventricular septal defect with a left-to-right shunt. However, in a minority of cases, the septal defect is contained in the fibrous tissue, resulting in a pseudoaneurysm of the interventricular septum. The typical aspect is of a rightward outpouching of the basal septum with a narrow neck and no shunt between the ventricles [1-5]. However, septal pseudoaneurysms have been described in both the middle apical region and the membranous septum [8-12].

The optimal management of pseudoaneurysms of the interventricular septum is unclear. This is due to the limited number of cases, with most of the data coming from case reports. Surgical therapy is the standard of care as it is a mechanical complication of myocardial infarction. This may be due to the fact that conservatively treated cardiac pseudoaneurysms are associated with high mortality. However, the optimal timing for intervention is uncertain. The need for sternotomy, cardiopulmonary bypass and general anesthesia are associated with high morbidity [1,11,12]. The development of percutaneous closure devices has brought new options. There are a growing number of case reports showing promising results. This suggests that minimally invasive therapy could be a viable alternative to open surgery in selected cases [8,11].

In conclusion, the course of myocardial infarction can be unpredictable even in the era of percutaneous coronary interventions. Mechanical complications are still possible. Multimodal cardiac imaging plays a key role in accurate diagnosis and management. New minimally invasive therapies are available for selected cases.

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