Unexpected outcome (positive or negative) including adverse drug reactions

Impending myocardial rupture: is an early surgical treatment enough?

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Summary

A 53-year-old man with a high-risk cardiovascular profile presented to the emergency department for a subacute myocardial infarction with signs and symptoms suggesting impending myocardial rupture. The case seemed to be resolved by an early successful surgical intervention. At 6-month follow-up, after repeated cycles of cardiac rehabilitation, the echocardiography revealed a pseudo-aneurysm of the apex and a left-to-right shunt through an inter-ventricular septum defect. The patient needed a new surgical intervention to repair this unexpected complication.

BACKGROUND

Myocardial rupture is a dramatic complication of myocardial infarction. It occurs in 1% to 6% of all patients admitted with ST-elevation myocardial infarction (STEMI), with an early frequency peak within 24 h, and a late peak from 3 to 5 days after STEMI.^{1 2} Reperfusion therapy reduces the risk of early rupture, but late administration of fibrinolytic therapy (i.e. more than 14 h) increases this risk.² A marked reduction in the occurrence of acute free wall rupture has been observed from the preinterventional to the primary angioplasty era.³ Age >65 years, female gender, first myocardial infarction, anterior location, but also hypertension during the acute phase of STEMI, lack of previous angina or myocardial infarction and therefore of

collateral circulation, Q waves on ECG indicating transmural necrosis, use of corticosteroids or non-steroidal anti-inflammatory drugs (NSAIDs) are well-known risk factors for heart rupture.¹⁻⁴

Sudden death is the most common clinical presentation of acute free wall rupture, but in approximately 25% of cases, the presentation is subacute, giving time for intervention; in these cases some clinical and electrocardiographic predictors, such as recurrent chest pain, emesis, agitation, syncope, persistent or recurrent ST-elevation, ST-elevation in a VL lead may arouse the suspicion of impending rupture.¹⁻⁵ Free wall rupture may also progress to pseudo-aneurysm, whose wall, consisting of pericardium and clot, prevents exsanguination and tamponade.

Figure 1 Echocardiography: large aneurism of the left ventricle involving the apical walls, with an apical thrombus.

Figure 2 Coronary angiography: occlusion of the left anterior descending artery at the mid-tract without any collateral circulation and critical stenosis of the second diagonal and the third tract of the right coronary artery.

Figure 3 Left ventriculography: large pseudo-aneurism of the apex with persistence of contrast media along the apex walls.

In this case, pericardiocentesis for relief of tamponade and emergency surgical repair may be life-saving,² thus underlining the importance of an early diagnosis and an optimal heart-team co-operation.

A fourth, less common presentation of myocardial rupture is impending free wall rupture, characterised by a thin epicardial layer containing the complete laceration of the left ventricle, is less common presentation of myocardial rupture,⁶ which often evolves towards abrupt free wall rupture and death. Nevertheless, this latter clinical scenario has not been much investigated and doubts remain on the appropriateness of emergent surgical management,^{7 8} even in the international guidelines.^{1 2}

The diagnosis of this condition requires multi-modality imaging. Coronary angiography must be performed without delay, in order to confirm the diagnosis of myocardial infarction, to reveal the culprit lesion and to give the surgeon relevant information to perform contemporaneous coronary artery bypass grafting and free wall rupture repair.^{1 2} A round-shaped contrast persistence after the ventriculography has been suggested to be a sign of impending left ventricular rupture.⁹ Ecocardiography,^{10 11} MRI and CT¹² may also be helpful to diagnose impending rupture.

CASE PRESENTATION

We report the case of a 53-year-old caucasian male with a high-risk cardiovascular profile (smoking, hypertension, hyperlipidaemia, familiar history of ischemic heart disease). He presented to the emergency department because of a 20 day-lasting interscapular pain, worsening in the last 18 h and treated by NSAIDs, and exertional dyspnoea during the previous week. Vital parameters were within the normal limits (oxygen saturation 96% on room air, heart rate 85/min) except for a mild hypotension (100/60 mm Hg). The physical examination showed crackles at the lower lung fields (Killip class 2). During the initial observation in the emergency department, the patient had a syncope with rapid recovery of consciousness. The electrocardiogram showed Q waves in the precordial and inferior peripheral leads with persistent ST-elevation from V2 to V6. The troponin I was slightly elevated (1.56 ug/l). As a result of these findings the patient was transferred to the coronary care unit. Acetylsalicylic acid (ASA) and clopidogrel 600 mg loading dose were early administered. An echocardiogram demonstrated a large aneurism of the left ventricle involving the apical walls, with an apical thrombus (figure 1). Coronary angiogram revealed an

Figure 4 Postoperative echocardiogram showing a left ventricle of normal size and global systolic function.

Figure 5 Echocardiography at 6-month follow-up showing an apparent dehiscence of Dacron patches realising a new pseudo-aneurysm, and a left-to-right shunt through an inter-ventricular septum defect localised into the apical segment of the inferior septum.

occlusion of the left anterior descending artery at the mid-tract without any collateral circulation and critical stenosis of the second diagonal and the third tract of the right coronary artery (figure 2). The ventriculography confirmed the presence of a large pseudo-aneurysm of the apex with persistence of contrast media along the apex walls (figure 3).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis between this condition and the pseudo-aneurysm is not simple and requires imaging

techniques, such as CT or MRI, that are not always available and not feasible at the bedside, so could require an unacceptable waste of time in this emergency situation. Echocardiography may be a valid diagnostic tool in this setting.

TREATMENT

The local heart-team decided for an urgent surgical intervention of aneurysmectomy. When pericardium was opened, a considerable volume of fluid mixed with fibrin leaked out.

Figure 6 Cardiac magnetic resonance at 6-month follow-up showing a multi-lobed pseudo-aneurysm leaning forward against the chest wall and imprinting the anterior wall and the apex of the right ventricle.

Figure 7 Echocardiographic image showing the successful outcome of the second surgical intervention.

Myocardium appeared particularly soaked, making it difficult the recognition of coronary vessels. Left ventricle wall was extremely thin and a large thrombus was adherent to the luminal side. After removing the thrombus, aneurysmectomy and left ventricle repair were performed using the modified ventriculoplasty with Cooley-Dor technique with reconstruction of the ventricular wall using Dacron patch. Intra-aortic balloon pump (IABP) was also positioned from the left femoral artery. The patient was extubated on the second postoperative day and IABP was removed on the next day. Inotropic drugs were slowly tapered off and on the sixth day, the patient was transferred to the cardiac surgery ward. A postoperative echocardiogram showed a left ventricle of normal size and global systolic function (end-diastolic volume 34 ml/m², ejection fraction 55%) (figure 4). Mild mitral regurgitation and minimal pericardial effusion around the apex were present.

In the thirteenth postoperative day, the patient was transferred to a cardiac rehabilitation centre. Medical treatment with ASA, warfarin, β -blocker, diuretics, amiodarone and statin was prescribed at discharge. During the next months, he followed an outpatient program of cardiac rehabilitation with monitored aerobic and calisthenics exercises.

OUTCOME AND FOLLOW-UP

At the 6 month follow-up visit, the patient reported no symptoms and good functional capacity. Surprisingly, an echocardiogram showed an apparent dehiscence of Dacron patches realising a new pseudo-aneurysm, and a left-to-right shunt through an inter-ventricular septum defect

localised into the apical segment of the inferior septum (figure 5). Right ventricle pressure, indirectly measured by continuous flow Doppler of tricuspid regurgitation, was high and varied during the exam from 35 to 65 mm Hg, due to the increase in systemic arterial pressure and in the left-to-right shunt.

The patient was then readmitted to hospital for further investigation. Cardiac catheterisation confirmed a large pseudo-aneurysm of the left ventricle and a distal inter-ventricular septum defect with a left-to-right shunt of 2.6 l/min (Qp/Qs 1.7), associated with increased wedge pressure (mean 24 mm Hg), severe pulmonary hypertension (50/20 mm Hg) with normal arteriolar resistance and reduced cardiac index (1.9 l/min/m²). Cardiac magnetic resonance further defined the morphology of the pseudo-aneurysm which measured 10×4×4 cm, had multi-lobed margins and leaned forward against the chest wall and imprinted the anterior wall and the apex of the right ventricle (figure 6). It also confirmed a systolic left-to-right shunt through the aneurysm wall at the level of the inferior apical septum.

Then the patient underwent new surgical repair of the pseudo-aneurysm and of the ventricular septal defect. Surgical findings showed a septal and apical rupture without Dacron patch dehiscence. The intervention was successful, as confirmed by postoperative echocardiography (figure 7), and the patient was discharged.

DISCUSSION

Impending free wall rupture is an unclear clinical scenario in which indications and contraindications to emergency surgical repair co-exist. While, on the one hand, the risk

of acute surgery on a necrotic myocardium is high because of the frailty of the myocardial tissue, not yet substituted by fibrotic tissue,¹³ on the other, there is a high probability of evolving towards the complete free wall rupture that means sudden death in most cases. International guidelines on myocardial infarction do not clearly address these problems, so that the management depends on the efficient co-operation within the heart-team.

In our clinical case, many signs and symptoms suggested the possibility of subacute or impending rupture. In fact, patient was slightly hypotensive, had long lasting recurrent chest pain with signs of heart failure, had assumed NSAIDs in the previous weeks and experienced a syncope during initial observation. ECG showed Q waves and persistent ST segment elevation in the anterolateral leads. The coronary angiography revealed a total occlusion of the left anterior descending artery without collateral circulation, and a round-shaped contrast persistence in the region of the rupture was present at the ventriculography. Instead, no clear signs of free wall rupture, such as pericardial effusion or thrombus, were present at echocardiogram, but a large aneurism of the apical regions with thin walls was visible; contrast echocardiography was not performed. The features of impending rupture were then confirmed by the surgical findings.

Learning points

- ▶ The favourable postoperative clinical course, also supported by early echocardiographic findings, suggests that the decision to perform urgent surgery was correct and probably life-saving.
- ▶ However, the next decision to start-up a physical rehabilitation program shortly after surgery may have had a causal role in determining the septal rupture by incrementing venous return (preload) and arterial pressure (afterload) and, consequently, left ventricular wall tension. In synthesis, this case suggests that an early, aggressive cardiac rehabilitation may not be appropriate for this type of patients, who, instead, should be admitted to a more gradual rehabilitation program with a close clinical monitoring.

Competing interests None.

Patient consent Obtained.

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