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CASE REPORT

Repair of a giant left ventricular pseudoaneurysm with rupture of the interventricular septum

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Abstract
Presence of two combined mechanical complications of acute myocardial infarction is extremely rare and still associated with a high-operative mortality. We describe a 73-year-old male patient who presented with a giant left ventricular pseudoaneurysm associated with rupture of the interventricular septum. Surgical repair of both lesions was successfully accomplished.

Keywords Cardiac rupture · Myocardial infarction · Pseudoaneurysm

Introduction

Mechanical complications of acute myocardial infarction (AMI) are rare, especially in the current era of primary percutaneous angioplasty. Nevertheless, they are associated with a still high-operative mortality [1]. Among these, left ventricular (LV) free wall rupture is the most frequent one, followed by rupture of the interventricular septum (IVS), while double myocardial rupture (DMR), defined as the coexistence of two combined mechanical complications, is quite uncommon [2]. We describe here a patient with simultaneous rupture of the IVS and LV-free wall presenting as a giant pseudoaneurysm, which were successfully treated.

Case

A 73-year-old man with a past history of diabetes, arterial hypertension and smoke, was admitted to another hospital for acute pulmonary edema; 10 days previously he suffered a transient acute precordial pain, which was not investigated. On admission, sinus tachycardia and dyspnea at rest were present with ST-segment elevation in the antero-lateral leads on the ECG. On auscultation, a third heart sound was present while no murmur could be detected. A 2D-transthoracic echo showed a huge pseudoaneurysm of about 9 cm in diameter with severe LV dysfunction (25% ejection fraction) and mild mitral incompetence (Fig. 1a). Coronary angiography showed occlusion of the left anterior descending (LAD) coronary artery (Fig. 1b). Due to deterioration of his clinical condition with hypotension, anuria and signs of heart failure, the patient was transferred to our unit for emergency treatment. In the operative room, invasive arterial pressure was 50 mmHg while routine transesophagal echocardiography (TEE) confirmed the previous echo findings; particularly, LV ejection fraction was < 30% and pulmonary artery pressure 45 mmHg. After hemodynamic stabilization with inotropic drugs and intraortic balloon pump insertion, a median sternotomy was performed; the pericardium was opened revealing sero-hematic effusion with pericardial adhesions involving the LV apex. After systemic heparinization, the ascending aorta and both venae cavae were cannulated, cardiopulmunary bypass was instituted and the heart arrested with cold blood cardioplegia into the aortic root. Pericardial adhesions were resected and the thin wall of the pseudoaneurysm was opened (Fig. 2a). Inspection of the interventricular septum showed the presence of a previously undetected small defect at the level of the antero-apical septum (Fig. 2b). Repair was performed with a large patch of bovine pericardium to exclude the infarcted septal area sutured using a continuous running suture of 3/0 polypropylene to the healthy myocardium (Fig. 2c). A reductive ventriculoplasty was performed inserting into the LV cavity the finger of a glove filled with approximately 100 cc of saline and using a purse-string suture to reduce the

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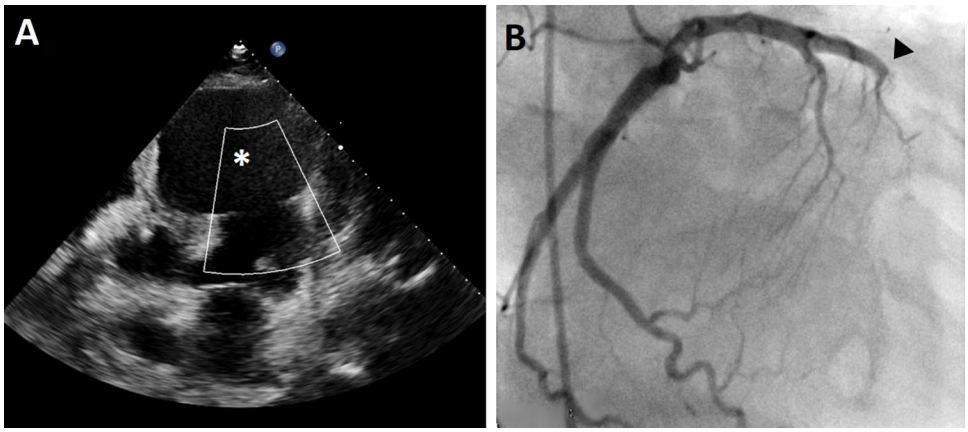

Fig. 1 **a** Echocardiographic view of the pseudoaneurysm (asterisk), **b** coronary angiography showing occlusion of the left anterior coronary artery (arrowhead)

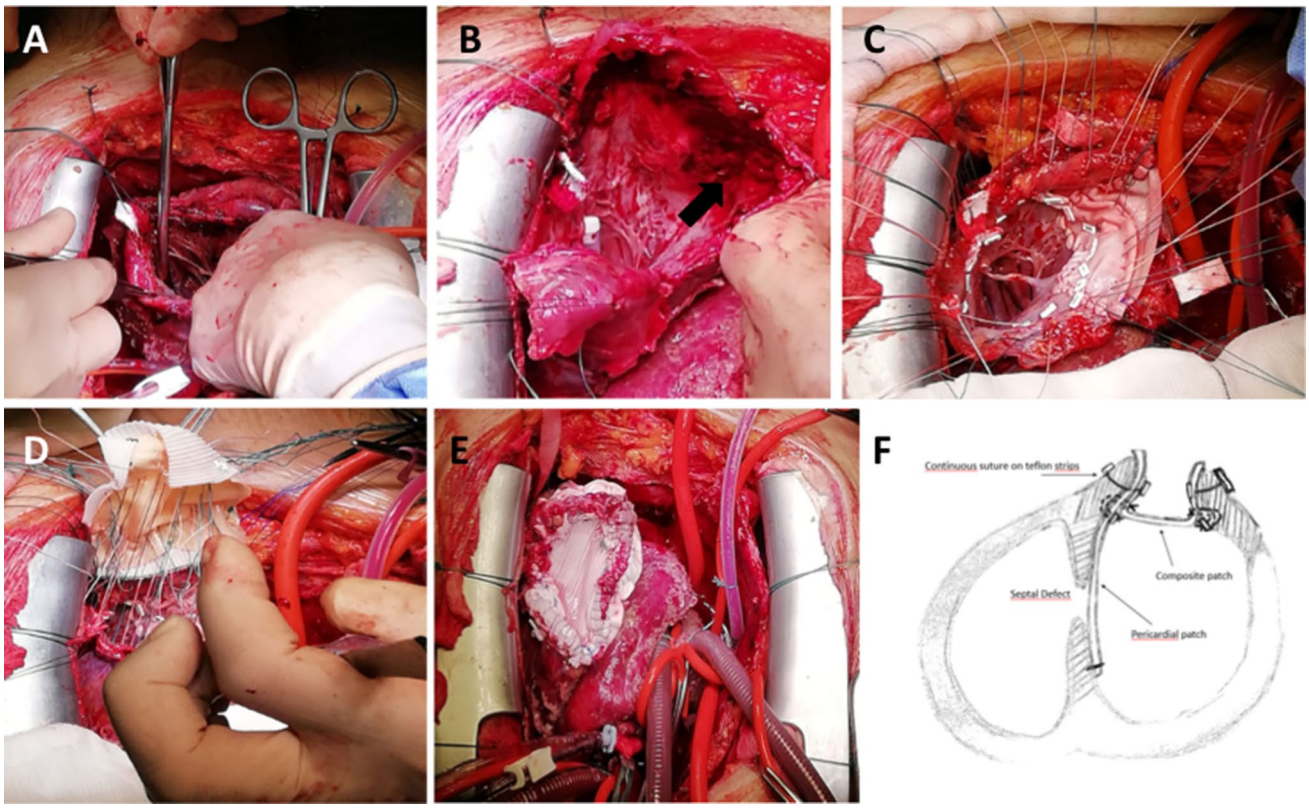

Fig. 2 **a** View of the left ventricular cavity after opening of the pseudoaneurysm. **b** Rupture of the interventricular septum (arrow). **c** Closure of the septal defect with a patch of bovine pericardium. **d** Preparation of the composite patch (pericardium and dacron) used to close the left ventricle. **e** Completed repair. **f** Schematic drawing of the surgical technique

neck of the pseudoaneurysm. The latter was then closed with a double patch made on the internal side of bovine pericardium and Dacron externally, reinforcing the suture with Teflon strips (Fig. 2d–f). Grafting of the LAD was not performed since it was included in the suture lines. The patient was weaned from bypass on both inotropic and mechanical support, with a mean arterial pressure of 60 mmHg and recovery of adequate urinary output; the intraoperative TEE showed reduction of the LV volume with substantially unchanged function. The subsequent course was uneventful. He was discharged after 8 days and after 1 month the control 2D echo showed a 40% LV ejection fraction.

Comment

Cardiac ruptures after AMI are classified as LV-free wall, IVS and papillary muscle ruptures. DMR occurs when two cardiac structures are involved by an AMI usually presenting with acute clinical features and hemodynamic instability, being associated with high mortality [3]. Rupture of the LV-free wall is the most frequent among mechanical complications of AMI, while the combination of IVS and LV-free wall rupture is extremely rare. The latter has been studied in detail from the clinicopathological point of view by Mann and Roberts in 1984 in seven autopsy cases [4]. They recognized two types of DVR classified as the *true* one (two separate ruptures) and the *junctional* one occurring at that area of the myocardium located directly anterior or posterior to the IVS; the *junctional* rupture usually produces a left-to-right ventricular shunt and/or a LV-pericardial communication.

Successful repair of combined IVS and LV-free wall rupture has been reported previously [5, 6]; moreover, Tanaka et al., in 2003, described the clinico-pathological characteristics of ten such patients, five of whom where surgically treated, with three survivors confirming the high operative mortality in this setting [3]. Our patient presented some interesting features. First, he suffered an AMI 10 days prior to admission with a contained LV rupture; during this interval a huge LV pseudoaneurysm developed causing acute cardiac failure. Second, the presence of an IVS rupture was not immediately detected at both transthoracic and transesophegeal echo but was an almost incidental operative finding. This may have been due most likely to the compression by the large LV cavity on the small IVS defect or by the anatomy of the rupture (*junctional*) causing a limited left-to-right flow difficult to detect even at intraoperative transesophagal echo. Repair was performed closing the IVS with a pericardial patch using the infarct exclusion technique [7], followed by LV remodeling. Closure of the LV wall was obtained with a double patch which we currently favor whenever repairing LV aneurysms since we believe that bovine pericardium as the inner layer may reduce the likelihood of thrombi formation on an akinetic area of the LV wall. This technique proved to be successful as witnessed by the surgical result and by the increase of the left ventricular ejection fraction, postoperatively. Indeed prompt repair of the lesions provided hemodynamic stability and adequate recovery of diuresis owing to correction of mechanical lesions responsible for the cardiogenic shock.

Conclusions

Combined rupture of the IVS and LV wall is a rare complication of AMI. Successful repair is feasible, as demonstrated in the present report, even in the presence of a huge LV pseudoaneurysm. In cases of *junctional* IVS rupture 2D echo may be unable to detect such lesion, which should, therefore, be excluded by accurate intraventricular inspection.

Compliance with ethical standards

Conflicts of interest The authors have declared that no conflict of interest exists.

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