Case Report

Coincident Detection and Concomitant Repair of a Ventricular Septal Defect during Emergency Coronary Artery Bypass Grafting and Left Ventricular Aneurysm Resection

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Keywords
Post-infarct ventricular septal defect · Left ventricular aneurism · Intra-aortic balloon pump · Intraoperative transesophageal echocardiography

Abstract
This case report presents an accidental detection of a post-infarct ventricular septal defect (VSD) by a patient undergoing emergent coronary artery bypass grafting and left ventricular aneurysm resection. Both myocardial lesions were repaired simultaneously through the left ventricular aneurysm. The patient's postoperative course was uneventful. This case shows the importance of intraoperative transesophageal echocardiography, as well as inspection of the interventricular septum, in an emergency setting to detect possible infarct VSDs.

Introduction

The incidence of mechanical complications of acute myocardial infarction (MI) has decreased significantly due to rapid development of emergency revascularization technics. However, the natural evolution of the untreated MI can be complicated by ventricular septal defect (VSD) and left ventricular aneurysm. The simultaneous presence of both entities is extremely rare and requires a detailed perioperative examination.
Case Presentation

A 57-year-old man was admitted in our emergency department with typical angina symptoms and signs of congestive heart failure. Clinical examination revealed no heart murmurs, a light hypotension, and normal regular heart rate. The performed electrocardiography showed ST elevation in II, III, aVF and V3–5, indicating an anterior and posterior wall infarction.

In addition, a widened q-spike was found in V3 as a sign of an earlier MI. Transthoracic echocardiography (TTE) showed a large left ventricular aneurysm and non-homogenous echo signal, probably due to an intraventricular thrombus. No valvular defects were detected so far. The left ventricular ejection fraction was estimated at 25–30%. Coronary angiography revealed a total occlusion of left anterior descending artery (LAD), severe proximal stenosis of the 1st diagonal branch (D1) and the circumflex branch (CX), as well as proximal occlusion of the right coronary artery (RCA). Left ventriculography confirmed the presence of the aneurysm and lack of intracardiac shunts (Fig. 1).

The patient was urgently operated because of compromised hemodynamics. Before initiation of cardiopulmonary bypass, an intraoperative transesophageal echocardiography (TEE) was performed in order to exclude relevant valve diseases or other cardiac lesions. At this time, a suspicious left-to-right shunt via interventricular septum (IVS) was detected. After median sternotomy, the left internal thoracic artery (LITA) was prepared in pedicle technic and the cardiopulmonary bypass was established by cannulation of the ascending aorta and right atrium. The patient was cooled down to 34°C and the heart was fibrillated to avoid the thrombus disruption. After aortic cross-clamp, a cold blood cardioplegia was applied. Now the aneurysm was wide opened and a big thrombus was completely removed. The aneurysmal sac was resected. After inspection of the IVS, a small VSD could be detected (Fig. 2a) and was closed using two pledged sutures (Fig. 2b). The aneurysmal defect was closed using a bovine pericardial patch (Dor technique) (Fig. 2a–c). The coronary lesions in the D1, RCA, and CX were treated using LITA and two separately venous grafts, respectively. LAD bypass could not be performed due to total arterial occlusion. The flow measurement on the bypasses demonstrated a sufficient heart perfusion.

The patient was weaned from CBP with moderate inotropic and vasoconstrictor support. In order to increase the coronary perfusion and reduce the catecholamine requirement, an intra-aortic balloon pump (IABP) was implanted via left femoral artery. Afterwards, the IABP was weaned and explanted at the second POD. The placed Swan-Ganz catheter showed no signs of residual shunts, also confirmed after postoperatively performed TEE. The patient was transferred to the normal ward on the sixth postoperative day and on the fourteenth day, he was discharged from hospital. The last TTE pointed to a mild increase of the left ventricular ejection fraction (35%).

Discussion

Immediate revascularization is recommended in all patients presenting angina signs ≤12 h and ST segment elevation [1]. VSD is a rare but catastrophic complication of acute MI. In the pre-interventional era, VSD complicated 1–2% of MI and its mortality exceeded 90% [2]. After initiation of urgent revascularization, the incidence of post-infarct VSD decreased to 0.2% [3]. Surgical repair may be required urgently, but there is no consensus on the optimal timing for surgery [4]. The perioperative use of IABP could reduce the left-to-right shunt and catecholamine requirement [5].
The first successful concomitant surgical repair of VSD and left ventricular aneurysm was performed by Collis, using the access via left ventricle and profound hypothermia [6]. In the pre-echocardiography era, the clinical examination, including heart auscultation, as well as left ventriculography, were the most important means of investigation in the detection of infarct VSD [7]. In our case, both examinations were irrelevant for diagnosis of this lesion, probably due to the small dimension of VSD.

This case demonstrates the importance of intraoperative TEE, as well as inspection of the interventricular septum, in an emergency setting to detect possible infarct VSDs.

**Statement of Ethics**

The authors have no ethical conflicts to disclose. The written informed patient’s consent to publish this case report has been received.

**Disclosure Statement**

The authors have no conflicts of interest to declare.

**Author Contributions**

Alexandru Mogaldea – manuscript design, data acquisition and analysis, manuscript writing, final approval; Stefan Ruemke – manuscript design, data acquisition and analysis, manuscript writing, final approval; Axel Haverich – manuscript design, data analysis, manuscript revision, final approval; Issam Ismail – manuscript design, data acquisition and analysis, manuscript revision, final approval.

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Fig. 1. The left ventriculography confirmed the presence of infarct left ventricular aneurysm and lack of intracardiac shunts.

Fig. 2. The inspection of IVS revealed a VSD (a). Black arrow indicates VSD. The VSD was closed using a pledged suture (b). Asterisk indicates the repaired VSD. The final aspect of aneurysm resection and ventricular closure (c).