Work in progress report - Cardiac general

Emergency surgical closure of postinfarction ventricular septal defect on the beating heart

Piotr Siodalski, Krzysztof Jarmoszewicz*, Jan Rogowski, Jarosław Jurowiecki

Department of Cardiac Surgery, Medical University of Gdańsk, 80-211 Gdańsk, ul. Debinki 7, Poland

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Abstract

We present a 77-year-old female with recent myocardial infarction complicated by antero-apical ventricular septal defect (VSD) and quick development of low cardiac output. Using interrupted horizontal mattress sutures VSD closure was successfully performed on the beating heart. Transthoracic echocardiography at the four-month follow-up did not reveal residual VSD.

Keywords: Postinfarction cardiac complication; Off-pump

1. Introduction

Postinfarction ventricular septal defect (VSD) is a rare but serious complication of myocardial infarction and is usually followed by low cardiac output and multi-organ failure. Medical treatment is known to be not efficient in these cases and early surgical treatment is recommended to reverse the hemodynamic deterioration.

2. Case report

In March 2006, a 77-year-old female patient was admitted to our hospital with a three-day history of chest pain, weakness and increasing dyspnea. Twelve-channel electrocardiography (ECG) on admission showed pathologic Q waves and ST segment elevation in I, aVl, V1–V4 channels. Serum concentration of cardiac enzymes was significantly increased. Transthoracic echocardiography revealed akinesis of antero-apical part of the left ventricle and anterior part of the interventricular septum, ejection fraction was about 35%. Recent three-day antero-septal myocardial infarct was recognized. Coronary angiography revealed a totally occluded left anterior descending artery (LAD) and 90% stenosis of the circumflex artery (Cx). Due to still lasting chest pain and ST segment elevation on ECG, percutaneous coronary intervention (PCI) was performed. Infarct related artery (LAD) was opened and stent Liberte 2.75×32 mm was implanted with a good result (TIMI III). During the next days after PCI, the patient felt good, there was no chest pain and hemodynamic status was stable. On the sixth day, severe chest pain with tachycardia and systolic murmur at the left sternal border suddenly occurred. There were signs of congestive heart failure with blood pressure 70/50 mmHg, cardiac index 2 l/m², mixed venous blood saturation of 72% and arterial blood saturation of 89%. Direct transthoracic echocardiography revealed ventricular septal defect located on the antero-apical part of the septum, LVEF of approximately 40% and significant enlargement of the right ventricle with enormous tricuspid valve insufficiency. Color Doppler revealed a very large left to right shunt. Quick application of intraaortic balloon pump (IABP) and catecholamine support partially improved blood pressure but the patient still presented low cardiac output. The patient was subjected to surgical repair of VSD.

3. Method of operation

We decided to perform the operation on the beating heart because the VSD was located on a convenient position for this technique. Additionally, we wanted to apply as less invasive procedure as possible because the patient was in poor clinical condition. The cardiopulmonary bypass team was on standby so we could use it immediately if necessary. During the procedure circulation was supported with IABP and catecholamines. These were sufficient to maintain arterial blood pressure around 85/40 mmHg which allowed the procedure to continue without CPB. For better exposure, pericardial stitch was placed behind the heart and the heart was elevated. Using interrupted horizontal mattress sutures, supported with a Teflon strip, the whole antero-apical part of the infarcted myocardium with VSD inside was excluded on the beating heart (Figs. 1–3). This maneuver took only a few minutes and immediate improvement of the hemodynamic status was observed. Blood pressure increased to 220/120 mmHg, probably because the left to right shunt was closed. On the other hand, high doses of catecholamines were still acting. High blood pressure was stabilized by means of intravenous nitroglycerin...
infusion and catecholamine withdrawal. Then we administered 100 mg of heparin and performed saphenous vein bypass to the circumflex artery (Cx). Direct transesophageal echocardiography performed just after the procedure revealed totally occluded VSD. Cardiac index was 2.8 l/min, mixed venous saturation—62%, arterial blood saturation—92%. Intraaortic balloon pump support was continued with the intention to keep the circulation state stable without high doses of catecholamines. At our department, IABP is a standard support after VSD closure in every case.

4. Postoperative course

There were no serious complications during the postoperative course and hemodynamic status was stable without signs of congestive heart failure. Slightly increased chest drainage (1200 ml) with mild anemia and thrombocytopenia requiring erythrocytes concentrate infusion was noticed on the first day. On the fourth day the patient was extubated and the intraaortic balloon pump was removed. Transthoracic echocardiography on the sixth day after VSD repair did not reveal any residual leaks and ejection fraction of the left ventricle was about 40%. After three weeks the patient, in relatively good clinical condition, was discharged from hospital. Transthoracic echocardiography at the four-month follow-up did not reveal residual VSD. LVEF was approximately 45%. Mitral regurgitation was moderate.

5. Discussion

Ventricular septal defect is a rare complication after acute myocardial infarction. The incidence of VSD usually produces a large left to right shunt and mostly deteriorates clinical status of patients. So mortality with only medical treatment is extremely high, ranging up to 25% on the first day and 90% during four weeks after VSD assessment [1, 2]. That is why early surgical treatment is recommended to reverse the hemodynamic deterioration. Unfortunately, surgical repair is associated with a high mortality rate reaching 19–50% [3–7].

There are lots of different VSD repair techniques described in literature.

On the basis of our case we believe that antero-apical VSD may be quickly and effectively closed by plication of the infarct zone using Teflon-strip supported mattress sutures without necessity of CPB application. There was already a fourth case of antero-apical postinfarct VSD treated successfully by means of this method at our department. These were patients in the age group 74 to 79 years (one male, three females) with history of serious co-morbidities such as stroke event (two patients), renal dysfunction and chronic obstructive pulmonary disease (two patients). In all cases VSD was located in the antero-apical part of the septum and this was the main reason we decided to close VSD using this method. All patients were supported with IABP and small doses of catecholamine [3–5 days] during the postoperative course but there were no other serious complications. All patients were discharged from hospital after 2–3 weeks from operation. After mean six-month follow-up all four patients were in relatively good clinical condition (three patients in NYHA class II, one patient in NYHA class III). Transthoracic echocardiography did not reveal any residual VSD during the follow-up period in all four cases. Left ventricle ejec-
tion fraction was between 35% and 55%, one patient had moderate mitral regurgitation.

So we can recommend this technique as a very simple and less invasive procedure which may be considered particularly in patients with antero-apical VSD and with serious co-morbidities which are contraindications to CPB. We are going to develop this technique further for better estimation of its clinical advantages.

References


