

Echocardiographic diagnosis of a massive left ventricular pseudoaneurysm: a case report

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Kardiologia i Torakochirurgia Polska 2015; 12 (2): 181-183



Abstract

Left ventricular aneurysm is one of the most troublesome complications of myocardial infarction. This complication results from LV wall rupture and presents as a cavity contained by pericardium and fragments of the ruptured wall. The risk of pseudoaneurysm rupture is very high and this makes the prognosis for the disease extremely unfavorable. A surgical correction, involving a patch repair of the LV wall, seems to be the only treatment modality. Echocardiography makes it possible to diagnose pseudoaneurysm of the left ventricle in most cases, while intraoperative transesophageal echocardiography is required for the in-process monitoring of intracardiac hemodynamics and assessment of intervention efficiency.

Key words: transesophageal echocardiography, left ventricular pseudoaneurysm.

Streszczenie

Tętniaki lewej komory stanowią jedno z najbardziej problematycznych powikłań zawału mięśnia sercowego. Wynika ono z pęknięcia ściany lewej komory, a objawia się obecnością jamy ograniczonej osierdziem i fragmentami pękniętej ściany. Ryzyko pęknięcia tętniaka rzekomego jest bardzo wysokie, toteż rokowanie w takich przypadkach jest skrajnie niekorzystne. Korekcja chirurgiczna wady związana z naszczeniem łaty na ścianę lewej komory wydaje się jedyną możliwością leczenia. W większości przypadków echokardiografia umożliwia zdiagnozowanie tętniaka rzekomego lewej komory; z kolei śródoperacyjna echokardiografia przezprętykowa konieczna jest do monitorowania hemodynamiki wewnątrzsercowej i oceny skuteczności interwencji.

Słowa kluczowe: echokardiografia przezprętykowa, tętniak rzekomy lewej komory.

Introduction

Pseudoaneurysm of the left ventricle (LV) usually develops following ventricular rupture due to transmural myocardial infarction [1]. Female sex, age, previous stroke, ST elevation, positive cardiac biomarkers, and heart rate at presentation were independently related to heart rupture [2].

Massive pericardial tamponade is the most common cause of fatal outcome of patients with free wall rupture, but in some cases, the thrombus becomes organized within the limits of the surrounding tissues and pericardium, which results in pseudoaneurysm formation [1-4]. The risk of pseudoaneurysm rupture is very high, and this makes the prognosis for the disease extremely unfavorable. A surgical correction, involving a patch repair of the LV wall, seems to be the only treatment modality [1-4].

Echocardiography is a tool to diagnose left ventricular pseudoaneurysm.

We report a patient who developed acute myocardial infarction followed by massive posterior LV pseudoaneurysm, diagnostics and its successful surgical treatment: the Dor procedure and coronary artery bypass grafting.

Case study

Patient F, 51 years old, who presented with a one-month history of episodes of chest pain, was admitted to the emergency department. He had not been referring to doctors and due to this was not receiving therapy. He had complaints of acute chest pain with radiation to the left shoulder and dyspnea. On auscultation normal heart sounds and a midsystolic murmur grade II/VI were heard. Blood pressure was 160/110 mmHg. Complete physical examination revealed no further abnormalities. ECG showed ST-segment elevation in leads II, III, and AVF.

Coronary angiography revealed a subtotal stenosis of the anterior interventricular branch, and right coronary ar-

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tery occlusion. The patient underwent transthoracic echocardiography, which revealed moderately reduced ejection fraction (LV EF 37%), dilation of the left ventricle (end diastolic volume (EDV) was 341 ml), and dilation of the atria. Moreover, there were posterior LV dyskinesia and a defect of LV posterior and posteroseptal walls with aneurysm. LV aneurysm volume was 400 ml. Also moderate mitral regurgitation and mild to moderate tricuspid regurgitation were found.

Based on clinical information and instrumental findings, the following diagnosis was made: Coronary artery disease. Acute myocardial infarction followed by posterior LV aneurysm. Paroxysmal atrial fibrillation. Chronic heart failure, functional class: 2.

On the basis of these findings, MI was treated conservatively, and the patient was prepared for surgery: coronary artery bypass grafting and the Dor procedure. After stabilization of the severity of the condition and to obtain patient consent for surgery, the patient was admitted for surgical treatment to the Institute of Coronary and Vascular Surgery of the A.N. Bakoulev Center for Cardiovascular Surgery.

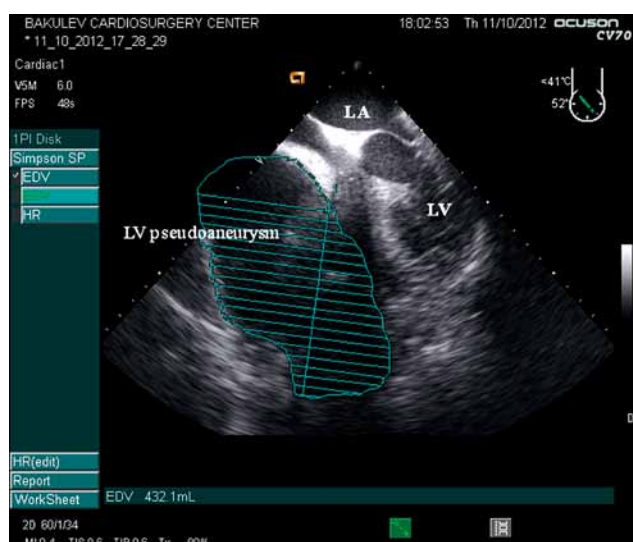


Fig. 1. Transesophageal echocardiography. LV pseudoaneurysm outlined (volume = 432 ml)
LV – left ventricle, LA – left atrium



Fig. 2. Transesophageal echocardiography. LV pseudoaneurysm. Epicardium flap in the area of LV pseudoaneurysm neck (arrow)
LV – left ventricle, LA – left atrium

Blood pressure was 125/75 mmHg and pulse 65 beats/min. ECG showed “persistent” Q-waves in leads II, III, and AVF. Before the operation, complex examination of the patient by the standard protocol was performed, the results of which showed that the patient did not have contraindications to surgery.

Surgery

The plan of the surgery included: mammary coronary bypass of the anterior interventricular branch, and the Dor procedure through hypothermic cardiopulmonary bypass. Prior to the principal stage of the operation, intraoperative transesophageal echocardiography was required to more precisely identify the aneurysm volume and assess the valvular abnormality.

Intraoperative TEE showed dilation of the LV (EDV = 270 ml) and moderately reduced EF (36%). There was a defect of posterior and posteroseptal LV walls with a 430-ml pseudoaneurysm (Fig. 1). Color Doppler revealed a partially thrombosed LV aneurysm in the pseudoaneurysm cavity. The aneurysm neck presented with an echo-positive epicardium flap that closed the neck during systole like a valve (Fig. 2). The diameter of the aneurysm neck was 33 mm (Fig. 3). The longitudinal and transversal axes of the LV pseudoaneurysm cavity measured 89 mm and 55 mm, respectively.

Mitral valve: the cusps appeared thin and mobile; we found moderate mitral regurgitation (Fig. 4). There was no sign of damage of the subvalvular apparatus of the mitral valve. The annulus of the mitral valve did not exceed 40 mm. Tricuspid valve: the cusps appeared thin and mobile; tricuspid annulus 37 mm; regurgitation of mild to moderate degree. There was echocardiographic evidence of pulmonary hypertension: the gradient between the right ventricle and right atrium was 30 mm Hg, and pressure of the right

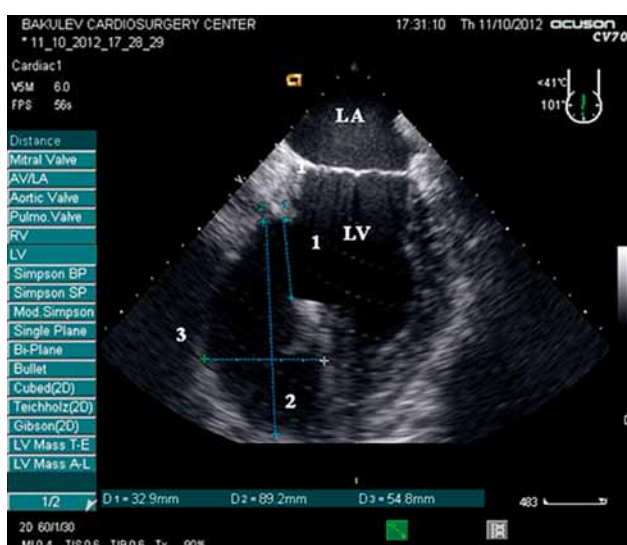


Fig. 3. Transesophageal echocardiography. Two-chamber view. LV pseudoaneurysm. Dimensions of cavity and diameter of connection with LV. 1 – neck diameter; 2 – longitudinal axis of LV aneurysm cavity; 3 – transversal axis of LV aneurysm cavity
LV – left ventricle, LA – left atrium

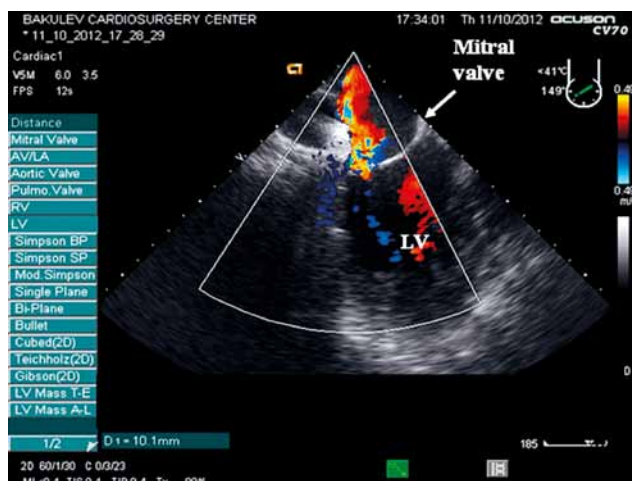


Fig. 4. Transesophageal echocardiography. Color Doppler mapping. Mitral incompetence mild to moderate
LV – left ventricle

ventricle was estimated to be 30 mm Hg+ central venous pressure 10 mm Hg = 40 mm Hg. Assessment of right ventricular function included tricuspid annular plane systolic excursion (TAPSE) and tissue Doppler imaging of the tricuspid annulus (S). These parameters were 16 mm and 11 cm/s, respectively.

The surgical technique included LV pseudoaneurysm repair using an autologous pericardial patch. The pericardial patch was toughened with glutaraldehyde after resection, and shaped to close the ruptured area. We used a circular patch to reconstruct the left ventricle ("endoventricular circular plasty") in order to maintain physiologic cavity (the Dor procedure) [4].

After the principal stage of the operation, a check-up transesophageal examination was performed (Fig. 5). A patch in the LV wall defect site was clearly visible; LV EDV 200 ml, LV EF 36 %; mitral regurgitation was mild to moderate, tricuspid regurgitation was trace to mild.

The postoperative period was uneventful and, on the 2nd day, the patient was transferred from the intensive care unit to an ordinary ward. On the 14th day after the operation, the patient was discharged from the hospital.

Transesophageal echocardiography was performed 12 months after the operation. Follow-up data: LV EDV = 168 ml, LV EF = 41%, mitral regurgitation was trace to mild. There were no problems with the patch. The patient's angina and chronic heart failure improved up to 1st functional class. He has continued to take anti-arrhythmic medication with no atrial fibrillation paroxysm during the last year.

Two years after surgery, the patient has received conservative medical therapy and does not have episodes of chest pain. His physical examination is normal.

Discussion

Intraoperative transesophageal echocardiography plays an important role in clarifying cardiac anatomy and esti-

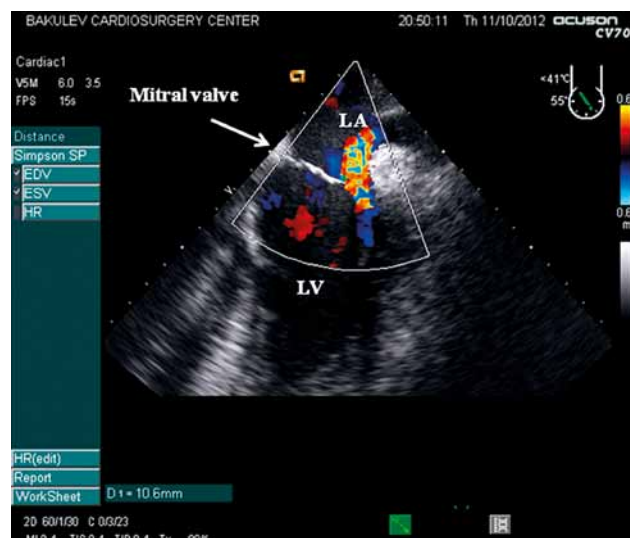


Fig. 5. Transesophageal echocardiography. Color Doppler mapping. Mitral incompetence II after principal stage of operation
LV – left ventricle, LA – left atrium

mating left ventricular volumes, ejection fraction, and mitral regurgitation in patients with ischemic heart failure undergoing this surgery. Also echocardiography allows evaluation of the surgical results [5, 6].

The choice of the technique to close the neck of the pseudoaneurysm is based on the extent of the defect and the status of the myocardium. Pericardium is an excellent material for surgical repair of certain acquired defects [1].

There is a high risk of death when conservative treatment of pseudoaneurysms is used. Pseudoaneurysms can be repaired surgically, with acceptable mortality, until a more appropriate method becomes available [1].

Disclosure

Authors report no conflict of interest.

References

1. Fedakar A, Bugra O, Onk A, Mataraci I, Eren E, Zeybek R. Repair of left ventricular pseudoaneurysms. *Asian Cardiovasc Thorac Ann* 2010; 18: 39-43.
2. López-Sendón J, Gurfinkel EP, Lopez de Sa E, Agnelli G, Gore JM, Steg PG, Eagle KA, Ruiz Cantador J, Fitzgerald G, Granger CB for the Global Registry of Acute Coronary Events (GRACE) Investigators. Factors related to heart rupture in acute coronary syndromes in the Global Registry of Acute Coronary Events. *Eur Heart J* 2010; 31: 1449-1456.
3. Alshibaya MM, Buslenko NS, Dorofeev AV, et al. Effect of myocardial revascularization and geometrical LV reconstruction on mitral insufficiency in patients with ischemic cardiopathies and post-infarction cardiac aneurysms. *Bul. A.N. Bakoulev RCCVS, RAMS* 2008; 9: 171.
4. Dor V, Saab M, Coste P, Kornaszewska M, Montiglio F. Left ventricular aneurysm: a new surgical approach. *Thorac Cardiovasc Surg* 1989; 37: 11-19.
5. Eren E, Bozbuga N, Tokar ME, Keles C, Rabus MB, Yildirim O, Guler M, Balkanay M, Isik O, Yakut C. Surgical treatment of post-infarction left ventricular pseudoaneurysm: a two-decade experience. *Tex Heart Inst J* 2007; 34: 47-51.
6. Shiota T, McCarthy PM. Volume reduction surgery for end-stage ischemic heart disease. *Echocardiography* 2002; 19 (7 Pt 1): 605-612.