

Left ventricular pseudoaneurysm following atrioventricular groove rupture after mitral valve replacement

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Miha Antonic, Anze Djordjevic , Tamara Mohorko, Rene Petrovic, Robert Lipovec and Peter Juric

Abstract

Left ventricular pseudoaneurysm is a partial cardiac rupture, contained by the surrounding pericardium that maintains communication with the left ventricular lumen. Whereas most cases of left ventricular pseudoaneurysms are related to myocardial infarction (loss of myocardial integrity), only a handful are associated with valve surgery. We present a female patient, who was admitted for elective mitral valve replacement. After the implantation of the mechanical valve, we encountered a rupture of the atrioventricular groove. After 3 months, a left ventricular pseudoaneurysm was found and the patient was reoperated. The valve was explanted and the inspection of the annulus and previously implanted pericardial patch revealed a loosened stitch on the inferior (ventricular) side. The defect was reinforced with additional stitches and the valve was reimplanted. In conclusion, we report an unusual case with two serious complications after mitral valve replacement – atrioventricular groove rupture and left ventricular pseudoaneurysm.

Keywords

False aneurysm, heart rupture, mitral valve, heart valve prosthesis implantation

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Introduction

Left ventricular (LV) pseudoaneurysm is a partial cardiac rupture, contained by the surrounding pericardium that maintains communication with the LV lumen.¹ It remains open to discussion how to appropriately distinguish LV pseudoaneurysms from true aneurysms that are defined by discrete thinning of the ventricular wall (<5 mm) and usually require elective surgical intervention.² On the other hand, pseudoaneurysms tend to rupture more easily and, although successful ‘wait and see’ approaches have been described,³ the diagnosis itself calls for an immediate response resulting in emergency surgeries in most cases. It was suggested that an orifice-to-pseudoaneurysm diameter ratio of 0.5 using two-dimensional echocardiography should be the margin when deciding between pseudoaneurysms and true aneurysms.⁴ Whereas most cases of LV pseudoaneurysms are related to myocardial infarction (loss of myocardial integrity), only a handful are associated with valve surgery⁵ and they tend to be subannular in location.⁶ It has been estimated that significant LV pseudoaneurysms occur in 0.8% of cases after mitral valve replacement (MVR),⁷ which is about eight

times more often than that after myocardial infarction.⁸ We report our experience with a patient with an LV pseudoaneurysm after MVR.

Case report

A 49-year-old female with history of progressing symptoms of dyspnoea, fatigue and dizziness (New York Heart Association (NYHA) class III) was admitted for MVR due to severe combined mitral valve stenosis and insufficiency. Preoperative echocardiography revealed rheumatic chordal shortening and severe mitral leaflet and annulus calcifications with a preserved LV function of 60%. Coronary angiography showed normal coronary arteries. At the time of surgery, the valve was not assessed suitable for repair. An

Department of Cardiac Surgery, University Medical Centre Maribor, Maribor, Slovenia

Corresponding author:

Miha Antonic, Department of Cardiac Surgery, University Medical Centre Maribor, Ljubljanska 5, 2000 Maribor, Slovenia.
Email: miha.antonc@guest.arnes.si



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MVR was performed using a SJM® (St. Jude Medical, Inc., Saint Paul, MN) mechanical valve of size 29. The valve was implanted using everted interrupted pledgeted polyester sutures. After excision of the calcified posterior leaflet, only moderate calcifications of the posterior annulus were encountered. At that time, surgical decalcification was not

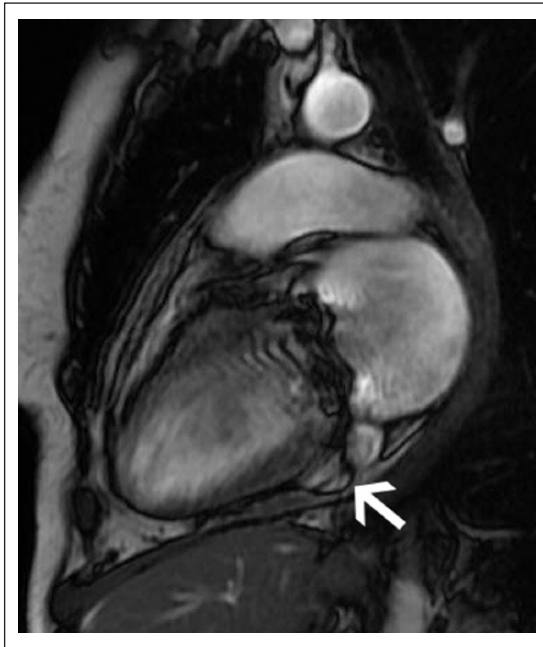


Figure 1. MRI scan – pseudoaneurysm (white arrow).

considered necessary. The pattern and extent of the calcifications allowed the sutures to be placed without decalcification of the annulus. After weaning from the cardiopulmonary bypass, bleeding was encountered from the inferolateral side of the left ventricle, in the area of the atrioventricular groove. Cardiopulmonary bypass was immediately reinstated and the valve explanted. A tear in the mitral annulus in the region P1/P2 was encountered. The tear was repaired with a bovine pericardial patch and the valve reimplanted. The patient was successfully weaned from the cardiopulmonary bypass. Postoperative course was uneventful and the patient was discharged home on postoperative day 11. After 3 months, the patient was readmitted because of fever and elevated white blood cell count. A transthoracic echocardiogram was suspicious for an ‘intrapericardial abscess’. Further evaluation, including transoesophageal echocardiography (TEE), computed tomography (CT) and magnetic resonance imaging (MRI) scan,⁹ revealed a $25 \times 35 \times 15 \text{ mm}^3$ pseudoaneurysm in the inferoposterior side of the heart with a 10-mm communication neck with the left ventricle (Figures 1 and 2). The patient was scheduled for the second surgery. The valve was explanted and the inspection of the annulus and previously implanted pericardial patch revealed a loosened stitch on the inferior (ventricular) side. The defect was reinforced with additional stitches and the valve was reimplanted. The lateral side of the heart and the pseudoaneurysm itself were not dissected free due to tight adhesions. An intraoperative TEE showed that the connection between the pseudoaneurysm and the left ventricle was closed (Figures 3 and 4). The postoperative course was uneventful and the patient was

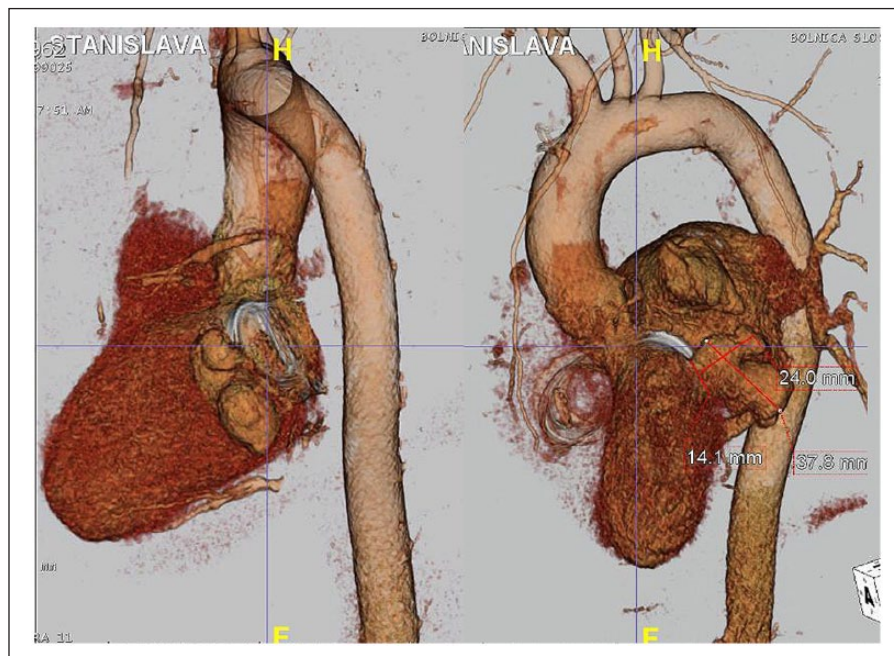


Figure 2. 3D reconstruction of a CT scan – clearly visible pseudoaneurysm ($24 \times 14 \times 38 \text{ mm}^3$).

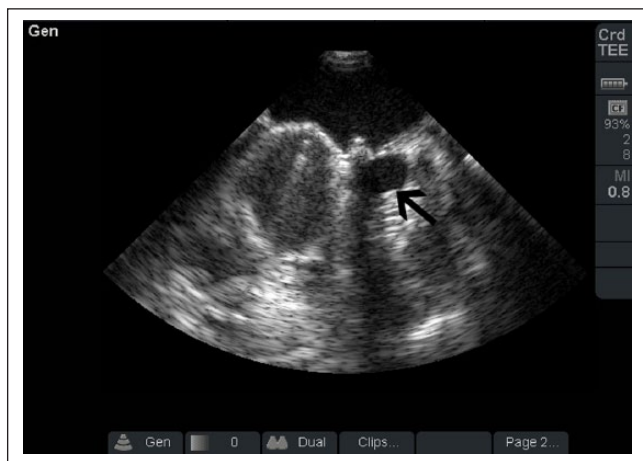


Figure 3. Intraoperative TEE – pseudoaneurysm (black arrow) adjacent to the mitral valve (left).

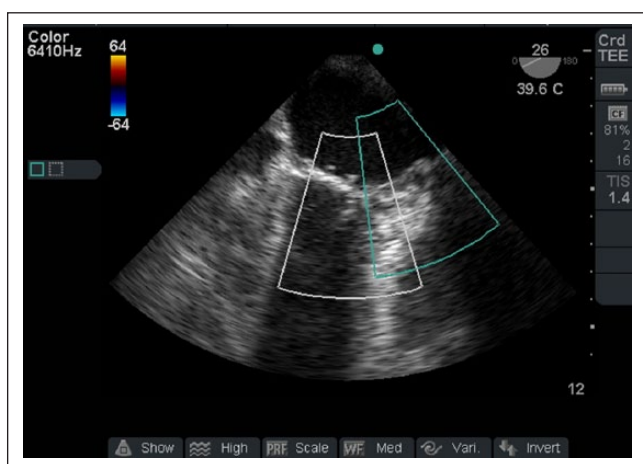


Figure 4. Intraoperative TEE after surgical repair – no visible pseudoaneurysm.

discharged home on postoperative day 12. She is doing well after 1-year follow-up.

Discussion

There are numerous complications described and known after MVR, such as thromboembolisms, structural valve degeneration, endocarditis, paravalvular leaks, conduction pathway irregularities and haemorrhage. One of the most devastating origins of massive haemorrhage is LV wall rupture, which was originally divided into three categories: type 1 is a rupture at the posterior atrioventricular groove; type 2 is a rupture at the base of the papillary muscle; and type 3 is a rupture between the above-mentioned structures.^{10,11} Sersar and Jamjoon¹² added two additional types: type 4 that is not associated with the atrioventricular groove, but with the lateral wall; and type 5 is a rupture of the LV outflow tract. According to this classification, our

patient is a type 1 representative. Both internal (from the endocardial) and external (from the epicardial site) surgical techniques are possible to repair LV pseudoaneurysms. The preferred approach in type 1 is the internal one, whereas in types 2 and 3 the defect is mainly in the myocardium and could therefore be managed via the external route.¹³ There are certain disadvantages for either of the techniques. Residual postoperative pseudoaneurysms are more common after the external repair, which is in turn less aggressive and commonly without the use of extracorporeal circulation (ECC). ECC is mandatory for internal repair. Although sometimes inevitable, valve removal and intraventricular rupture repair are associated with high mortality (65%–100%).^{12,14} Both techniques are not time dependant, usable for early onset (still in the operating room) or delayed (hours after the initial surgery) rupture.¹⁵ We opted for the internal surgical scenario through a re sternotomy with valve removal and intraventricular enforcement with sutures. No pseudoaneurysm resection was performed. Successful cases, where a similar LV pseudoaneurysm was resolved through a left thoracotomy in the fifth intercostal space, were reported.^{16,17} Interestingly, some authors reported various degrees of damage to the left circumflex artery (LCX), which could result in myocardial infarction to the lateral wall,^{13,18,19} but we have not noticed any ST line dynamics during in-hospital stay or at follow-up. Although valve removal and intraventricular rupture repair are associated with high mortality, we successfully repaired the LV pseudoaneurysm with excellent postoperative results.

Conclusion

We presented a post-MVR complication that is quite uncommon and could potentially be lethal. Our treatment method is well established, but could lead to serious adverse effects. Even though internal repair is more aggressive, excellent outcome was achieved.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

ORCID iD

Anze Djordjevic  <https://orcid.org/0000-0001-7551-9534>

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