

Surgical Treatment of Left Ventricular Pseudoaneurysm

Yan Zhang, Yan Yang, Han-Song Sun, Yue Tang

Department of Cardiovascular Surgery, Cardiovascular Institute and Fu Wai Hospital, Beijing 100037, China

To the Editor: Acquired pseudoaneurysm of the left ventricle is a rare disorder that usually occurs after transmural myocardial infarction or after cardiac surgery. Pseudoaneurysms of the left ventricle have a tendency to rupture, leading to death if there is no surgical treatment.^[1,2] Myocardial infarction is the most common cause of false aneurysms of the left ventricle, followed by cardiac surgery, trauma, and infection.^[3] This study retrospectively analyzed the surgical experience with left ventricular pseudoaneurysms.

From January 2012 to December 2016, seven patients (four males and three females, mean age was 55.1 ± 14.0 years) underwent operation for pseudoaneurysm of the left ventricle in Fu Wai Hospital. Left ventricular true aneurysms were excluded from this study. Five of the left ventricular pseudoaneurysms were discovered after transmural myocardial infarction, two patients with a postsurgical pseudoaneurysm. Chest tightness, shortness of breath could be found in two cases, angina pectoris in two cases, manifestations of angina pectoris complicated with congestive heart failure in three cases. At the time of hospital admission, cardiac ultrasound and computed tomography or magnetic resonance imaging were suggestive of a pseudoaneurysm formation. Mean pseudoaneurysm neck was 25.2 ± 13.2 mm, mean pseudoaneurysm diameter 60.3 ± 37.0 mm, and mean left ventricular ejection fraction $46.8 \pm 11.7\%$ (range: 30–60%). There were two cases with mitral insufficiency and one case with tricuspid regurgitation. Pseudoaneurysm thrombus could be found in six cases. Coronary angiography showed that five patients had coronary artery lesions. The median interval between myocardial infarction or cardiac surgery and diagnosis was 3 months.

Various techniques were used to obliterate the neck of the pseudoaneurysm. In six patients with a defect located close to the basal part of the left ventricle, the ventricular defect was closed with a patch of Gore-Tex or Dacron to avoid potential distortion of the heart structures or excessive traction on the edges of the defect. The repair was performed via midline sternotomy with the aid of cardiopulmonary bypass without embolic, bleeding, or mechanical complications. The capsule of pseudoaneurysm was not resected but rather was used as a second layer over the patch for reinforcing the reconstructed ventricular wall and hemostasis. Attention should be paid to the prevention of coronary artery injury. In one patient with postinfarction pseudoaneurysm, the occluded anterior descending artery became entrapped in the repair and was not bypassed. Occlusion was performed in one patient through left anterolateral fifth intercostal space without cardiopulmonary

bypass. Occlusion with an atrial septum defect (ASD) septal occluder (12 mm, Starway medical technology, V150801122039) was performed in this patient [Figure 1]. After discharge from the hospital, all patients were followed up in our center using two-dimensional echocardiographic examination.

The mean postoperative hospital stay was 9.8 ± 3.1 days, mean cardiopulmonary bypass time was 134.2 ± 51.7 min, mean aortic cross-clamping time was 89.8 ± 38.6 min, and mean postoperative ventilation time was 30.0 ± 18.7 h. No complications such as tracheotomy occurred. The mean follow-up time was 2.7 ± 0.6 years. All seven patients survived and discharged. No patient required reoperation.

Acquired left ventricular pseudoaneurysms develop after transmural myocardial infarction (55% in reviews), surgery (33%), trauma (7%), or infection (5%).^[4] Rupture of the left ventricle

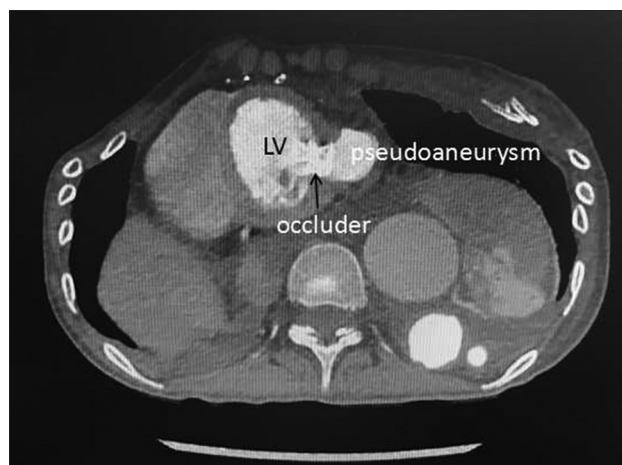


Figure 1: Occlusion with an atrial septum defect septal occluder was performed through lateral thoracotomy in a patient with postinfarction pseudoaneurysm. LV: Left ventricular.

Address for correspondence: Dr. Yan Yang,
Department of Cardiovascular Surgery,
Cardiovascular Institute and Fu Wai Hospital, A167, Beilishi Road,
Xicheng District, Beijing 100037, China
E-Mail: waikeshangyan@126.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

© 2018 Chinese Medical Journal | Produced by Wolters Kluwer - Medknow

Received: 28-02-2018 **Edited by:** Xin Chen
How to cite this article: Zhang Y, Yang Y, Sun HS, Tang Y. Surgical Treatment of Left Ventricular Pseudoaneurysm. Chin Med J 2018;131:1496-7.

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.4103/0366-6999.233954

after myocardial infarction usually leads to acute pericardial tamponade and immediate death. A few patients can survive if an adherent thrombus or pericardial adhesions seal the rupture and contain the bleeding. Postsurgical pseudoaneurysms occur after replacement of the mitral valve or arise on a previous ventriculotomy. The complication occurs in 0.02–2.0% of mitral valve replacements. Predisposing factors include resection of the posterior leaflet, overzealous decalcification of the annulus, insertion of an oversized prosthesis, and redo-mitral valve replacement (as was the case in this series), especially if the stent of a bioprosthesis has eroded the posterior ventricular wall. This study included five cases of myocardial infarction complicated with ventricular aneurysm formation, one case after Bentall surgery and one case after mitral bioprosthesis valve replacement surgery. Pseudoaneurysm (diameter 19 mm) was located between the left ventricular posterior wall of mitral annulus near right atrial side and left atrium.

When the diagnosis is established, surgical correction is usually mandatory. Surgery is urgently recommended when a pseudoaneurysm is discovered within the first 2–3 months after myocardial infarction because the onset of rupture is unpredictable. However, when the diagnosis is made years after myocardial infarction or surgery, the urgency and even the need for operation is determined by symptoms rather than by risk of rupture. If the preoperative circulation is not stable, intra-aortic balloon pump should be implanted as early as possible for adjuvant therapy. The size and location of the pseudoaneurysm determine the surgery. If a small chronic neck, aneurysm neck ligation can be directly closed. In patients with a defect located close to the basal part of the left ventricle (four cases), the side wall (two cases) of the ventricular defect was closed with a patch of Gore-Tex or Dacron to avoid potential distortion of the heart structures or excessive traction on the edges of the defect, then using the sandwich suture method for reinforcement with 4-0 double needle and felt piece. If caused by myocardial infarction ventricular pseudoaneurysm, coronary artery bypass graft should be performed, to improve the curative effect, reduce recurrence, and patch tear at the same time. In this study, one patient was unable to undergo revascularization for myocardial infarction.

Although the conventional treatment is surgical intervention, transcatheter device closure is emerging as a new alternative for high-risk surgical candidates,^[5,6] which was first described in 2004, the experience is still limited to a few reports, even large referral centers have limited experiences. As there is little guidance in the literature, device selection needs to be individualized depending on the location and size of the pseudoaneurysm, and adjacent structures. Several individual case reports have described the successful use of septal occluders, ventricular septal defect occluders, and coils. The margins may be necrotic and friable and give way during device placement or subsequently. To reduce device instability and the associated risk of device dislodgement, oversize ratios of 1.2–2.0

have been reported for the Amplatzer septal occluder in previous studies.^[6] In this case, postsurgical pseudoaneurysm occurred after Bentall surgery. Pseudoaneurysm neck is located in the side wall, aneurysm neck is small (about 8.5 mm) if no thrombus. Since this patient had the peripheral vascular disease, occlusion was performed through left anterolateral fifth intercostal space. We oversized the device by 6 mm (oversize ratio: 1.4), occlusion with an ASD septal occluder (12 mm, Starway medical technology, V150801122039) was performed. The lateral thoracotomy approach avoided sternotomy and cardiopulmonary bypass, reducing the significant morbidity associated with surgery. The patient had a short hospital stay.

In the treatment of left ventricular pseudoaneurysm, a traditional surgical technique can be used for repair. Furthermore, through a small incision, percutaneous repair of left ventricular pseudoaneurysm might be a good option for patients with high surgical risk.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

This study was supported by a grant from Beijing Natural Science Foundation Project (No. 7162161).

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Frances C, Romero A, Grady D. Left ventricular pseudoaneurysm. *J Am Coll Cardiol* 1998;32:557-61. doi: 10.1016/S0735-1097(98)00290-3.
2. Yu C, Zhu TG, Liu WL, Huang WF. Left-dominant arrhythmogenic cardiomyopathy: A case misdiagnosed as pseudoaneurysm. *Chin Med J* 2016;129:1763-4. doi: 10.4103/0366-6999.185874.
3. Fedakar A, Bugra O, Onk A, Mataraci I, Eren E, Zeybek R, *et al.* Repair of left ventricular pseudoaneurysms. *Asian Cardiovasc Thorac Ann* 2010;18:39-43. doi: 10.1177/0218492309353988.
4. Prêtre R, Linka A, Jenni R, Turina MI. Surgical treatment of acquired left ventricular pseudoaneurysms. *Ann Thorac Surg* 2000;70:553-7. doi: 10.1016/S0003-4975(00)01412-0.
5. Madan T, Juneja M, Raval A, Thakkar B. Transcatheter device closure of pseudoaneurysms of the left ventricular wall: An emerging therapeutic option. *Rev Port Cardiol* 2016;35:115.e1-5. doi: 10.1016/j.repc.2015.06.013.
6. Dudy Y, Jelnin V, Einhorn BN, Kronzon I, Cohen HA, Ruiz CE, *et al.* Percutaneous closure of left ventricular pseudoaneurysm. *Circ Cardiovasc Interv* 2011;4:322-6. doi: 10.1161/CIRCINTERVENTIONS.111.962464.