

Submitral Left Ventricular Aneurysms: Correction through a Transmitral Approach

Chirag Doshi¹, Sumit Modi¹, Aakash Dinesh Joshi^{1*}, Mohammed Ibrahim¹, Mausam Garachh¹, Opjinder Deepak¹

¹ Departments of Cardiothoracic and Vascular Surgery, UN Mehta Institute of Cardiology and Research, India.

ARTICLE INFO	ABSTRACT
<i>Article type:</i> Case Report	Introduction: Submitral aneurysms (SMA) are a rare heart condition that is more common among young Africans. The etiology is primarily congenital, but when SMA is found in patients of other races, other etiologies must be sought, especially ischemic. The other suggested aetiologies are infection and inflammation. Patients with submitral aneurysms can present with a variety of clinical manifestations.
<i>Article history:</i> Received: 19 December 2023 Accepted: 7 June 2024	Case presentation: We present the case of a 57-year-old male patient who was asymptomatic and admitted for evaluation. Transthoracic echocardiography revealed a submitral aneurysm.
<i>Keywords:</i> Aneurysm Left ventricle Submitral Thrombus Arrhythmia Pericardial effusion Case report	Clinical discussion: Submitral left ventricular aneurysm is a rare cardiac pathology with various of causes including inflammation, infection, traumatic illness, or, in rare instances, ischemic heart disease. It can result from a congenital defect in the posterior portion of the mitral annulus, which is more prevalent in the African population. Clinical manifestations can be severe, such as ventricular tachycardia, cardiogenic shock or an embolic phenomenon. However, asymptomatic cases are possible but uncommon.
	Conclusion: Our case highlights that SMA can be either the cause or result of coronary ischemia, emphasizing the importance of vigilance in patients with atypical clinical presentations.

► Doshi, C., Modi, S., Joshi, A.D., Ibrahim, M., Garachh, M., Deepak, O. Submitral Left Ventricular Aneurysms: Correction through a Transmitral Approach. *J Cardiothorac Med.* 2025; 13(1): 1494-1499. Doi : 10.22038/jctm.2024.77005.1441

Introduction

Submitral aneurysms of the left ventricle (LV) may be congenital or may occur after a myocardial infarction, trauma, or endocarditis. We report a case of a submitral LV aneurysm that was complicated by presence of mitral regurgitation. The clinical conditions, aneurysm size, and other findings determine whether to follow a nonsurgical strategy with close medical supervision or to perform surgery, which is the definitive management.

Case Presentation

Patient Information

A 57-year-old white male patient, who is a chronic smoker with no prior medical history, was admitted from an outpatient clinic. He stated that he is asymptomatic, but was incidentally diagnosed with a left ventricular aneurysm. During the clinical examination, his heart rate was 80 bpm, blood pressure was 130/60 mmHg, and oxygen saturation was 98% on room air. A per-critical electrocardiogram (ECG) revealed a normal sinus rhythm (Figure 1).

* Corresponding authors: Dr Aakash Dinesh Joshi; Departments of Cardiothoracic and Vascular Surgery, UN Mehta Institute of Cardiology and Research, India. Tel: + 9916038565; Email : draakashjoshi@gmail.com.

© 2016 mums.ac.ir All rights reserved.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

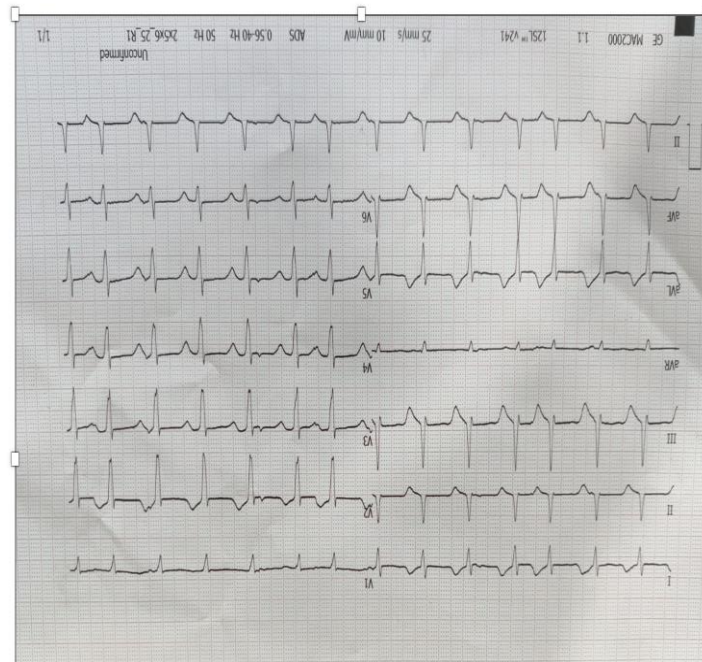


Figure 1.ECG showing normal sinus rhythm.

Transthoracic echocardiography showed an LV aneurysm with a left ventricular ejection fraction of 50% and regurgitation. The apical 4-chamber view revealed a large cavity (30 × 21 mm in diameter) adjacent to the mitral valve, communicating with the left ventricle via a single neck, but not with the left atrium. There was also mild pericardial effusion, which did not compromise right ventricular function (Figure 2). The coronary angiography showed normal coronaries.

However the cardiac CT scan revealed a focal contrast filled outpouching from the basal septum of the left ventricle, measuring approximately 30x20x58 mm (Figure 3).

Differential Diagnosis

It is important to differentiate between postinfarct pseudo-LV aneurysm and true aneurysm. This is primarily done by detecting the aneurysm beneath the posterior mitral valve leaflet, as seen in this case indicating the former. The presence of late gadolinium enhancement (LGE) in areas other than beneath the posterior mitral valve leaflet (PMVL) suggests an infarct etiology. Coronary artery disease was ruled out in this patient.

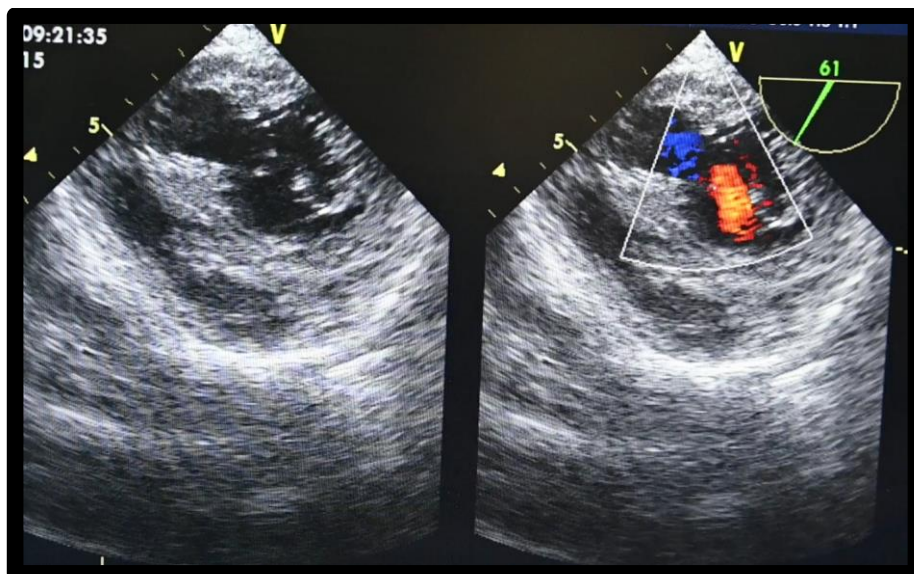


Figure 2. The apical 4-chamber view revealed a large cavity (30 × 21 mm in diameter).



Figure 3. Cardiac CT scan revealed a focal contrast filled outpouching from the basal septum of the left ventricle measuring approximately 30x20x58 mm.

Treatment

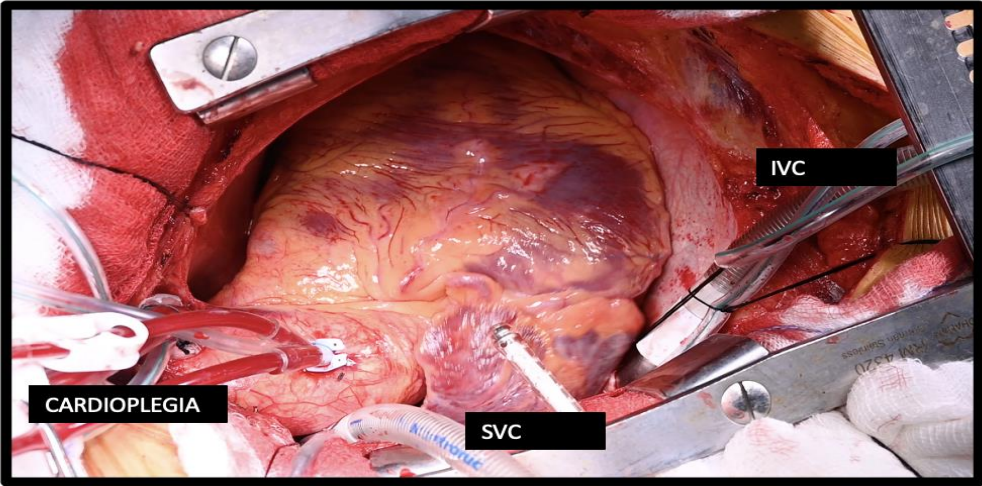
Curative treatment involves surgical aneurysmectomy, which requires a thorough preoperative assessment and planning. All operations were performed using standard cardiopulmonary bypass. During the surgery, the neck of the aneurysm was consistently found beneath the posterior mitral valve annulus, located between the anterolateral and posteromedial commissures. The transverse diameter varied, sometimes replacing up to two-thirds of this part of the annulus. The anterior mitral leaflet chordae especially the tertiary chordae could obscure the full extent of the neck and occasionally divide the aneurysm neck into 'pseudo multiple necks'. Traction sutures were placed at the edges of the aneurysm neck or at the corners of each opening in the case of multiple aneurysm necks to help define the extent of the defect.

The 'neck' of the aneurysm was closed with a PTFE patch, followed by pledgeted interrupted 2-0 or 3-0 multifilament polyester horizontal mattress sutures placed through the edge of the aneurysm neck on the left ventricular edge and then through the anterior mitral annulus. A mitral annuloplasty was then performed, usually using an annuloplasty ring.

The transmitral approach to repairing submitral left ventricular aneurysms results in lower operative mortality and morbidity, and almost invariably permits conservation of the mitral valve.

Outcome and follow-up

He is well and with normal daily function. He remains well and free of symptoms 1 months post follow-up.



AORTO BICAVAL CANNULATION

Figure4. Standard aorto-bicaval cannulation.

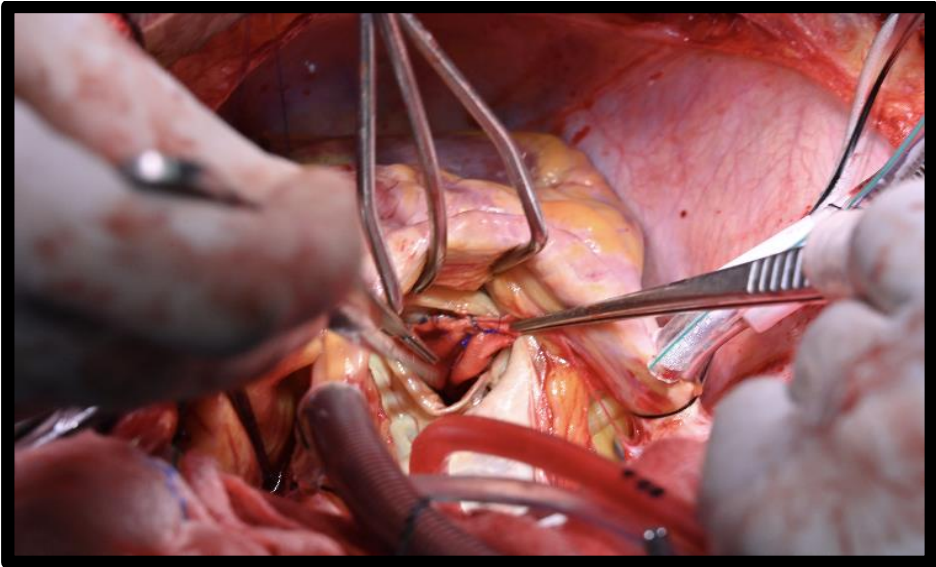


Figure 5. Illustration of closure of aneurysm neck with a Dacron patch.

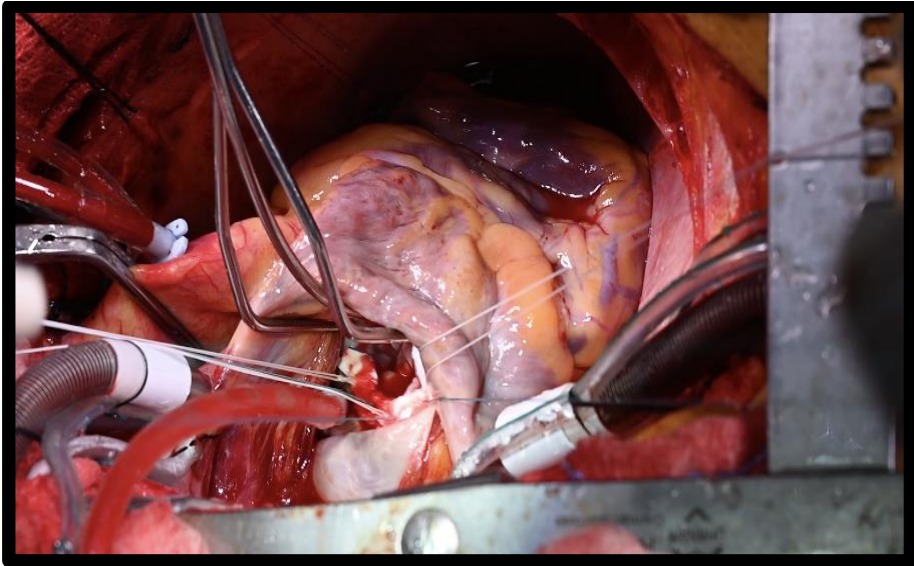


Figure 6. Illustration of anterior annuloplasty with Teflon felt.

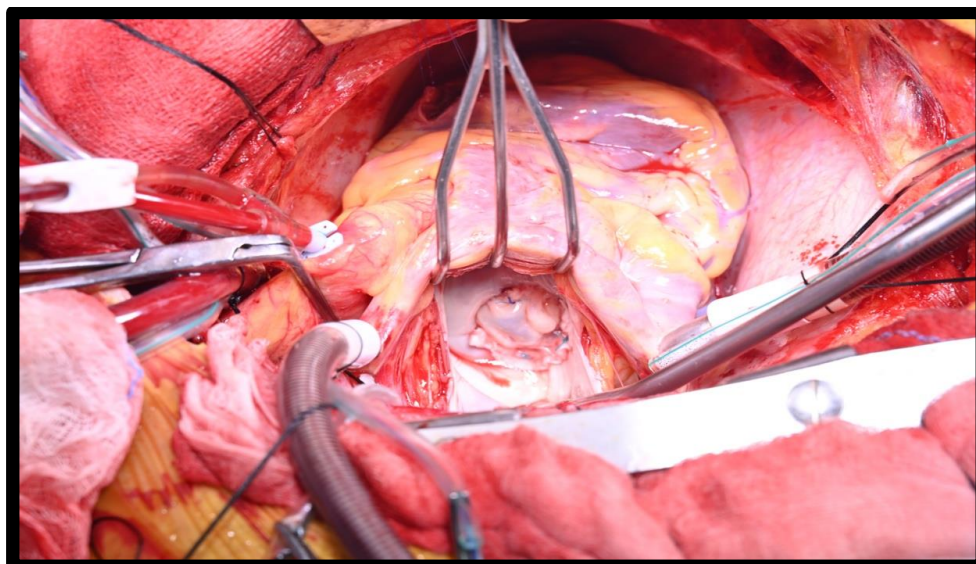


Figure 7. Illustration of mitral annuloplasty with closure of the neck of the aneurysm.

Discussion

SMA is rare, with only one case reported in central Asia. To the best of the authors' knowledge, based on literature reviews, this case report will be the first reported in an asymptomatic population.

The etiology of SMA is not completely understood and there is ongoing debate surrounding the topic. It is postulated to be congenital (1). The pathophysiology is thought to involve a disjunction between LV musculature and LA mitral valve region due to disturbances in complex embryogenesis. This theory is supported by the observation that SMAs occur in a typical location underneath the PMVL and have not been shown to arise from alternate sites in the mitral apparatus (1,2).

However, there are isolated case reports of SMAs in patients with underlying infectious and/or inflammatory conditions, suggesting that a second insult can lead to the manifestation of disease in predisposed individuals (2). Five reported cases of TB associated with SMA have been previously reported (2). There was another SMA case report involved a 9-year-old child with coinfection of HIV and TB (3). Patients with SMA present with a myriad of symptoms ranging from asymptomatic to shortness of breath, reduced exercise tolerance, and chest pain. These symptoms are due to mitral insufficiency with or without LV dysfunction. Patients may also present with arrhythmias

or thromboembolic events. Myocardial ischemia may occur secondary to compression of the left coronary artery. On the other hand, as in our case patients may also be asymptomatic (4).

In the era of advanced imaging, there are several modalities available for the evaluation of patients presenting with cardiovascular disease and in the setting of SMA (5). These include:

- 1- Echocardiography which is the first-line modality for detecting of submitral aneurysms. It also allows for the assessment of cardiac morphology and function, but it is operator dependent and may be limited by patient-related factors such as body habitus.
- 2- CT angiography, which provides detailed information on the coronary arteries, assessment of cardiac lesions, and the rest of the aorta. However, this modality requires cardiac gating or heart rate control.
- 3- A multiparametric cardiac MR assessment, which allows for accurate assessment of the morphology of the submitral left ventricular aneurysm (SLVA), tissue characteristics including inflammation, edema and enhancement, presence of thrombus, flow, and systolic function.

Learning Points

- Submitral left ventricular aneurysm is rare and postulated to be of congenital origin.
- Tuberculosis (TB) has been rarely associated with SMA and should be

considered in young patients with reduced LV function.

- This is the first case report of asymptomatic SMA.
- Multimodality imaging in the assessment of SMA includes echocardiography (ECHO), CT angiography, and robust cardiac MR (CMR). CMR offers superior resolution and multiparametric assessment of cardiac abnormalities and function.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

Institutional review board approval is not required for deidentified single case reports or histories, as per institutional policies.

Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images.

Declaration of Competing Interest

The authors have declared that they have no potential conflicts of interest with regards to the research, authorship, and/or publication of this article.

References

1. ABRAHAMS GD, Barton CJ, COCKSHOTT PW, Edington GM, Weaver EJ. Annular subvalvular left ventricular aneurysms. *QJM: An International Journal of Medicine*. 1962 Jul 1;31(3):345-60.
2. Ruiz D, Domingo P, Canals E, Mata J. Annular submitral left ventricular aneurysm. *European heart journal*. 1992 Mar 1;13(3):424-5.
3. Ribeiro PJ, Mendes RG, Vicente WV, Menardi AC, Evora PR. Submitral left ventricular aneurysm. Case report and review of published Brazilian cases. *Arquivos brasileiros de cardiologia*. 2001;76:399-402.
4. Luo WZ, Ni YM. Submitral left ventricular aneurysm: a rare disease in xanthoderm. *Annals of Thoracic and Cardiovascular Surgery*. 2014;20(Supplement):909-10.
5. Du Toit HJ, Von Oppell UO, Hewitson J, Lawrenson J, Davies J. Left ventricular sub-valvar mitral aneurysms. *Interactive Cardiovascular and Thoracic Surgery*. 2003 Dec 1;2(4):547-51.