

Successful Percutaneous Device Closure of Ventricular Septal Rupture in a Patient with Acute Anterior Wall Myocardial Infarction and Cardiogenic Shock

**Gurkirat Singh^{1*}, Mahesh Bodkhe¹, Akshat Jain¹
and Narender Omprakash Bansal¹**

¹*Department of Cardiology, Grant Medical College and Sir J. J. Group of Hospitals, Mumbai, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Author GS designed the manuscript, provided the clinical finding, the laboratory findings and images for the study and wrote the first draft of the study. Authors MB and AJ managed the literature searches. Author NOB revised the manuscript. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Post-infarction ventricular septal rupture (VSR) is a rare but lethal mechanical complication of acute myocardial infarction. The incidence of VSR has decreased from 1-3% following ST-segment elevation myocardial infarction in the pre-reperfusion era to 0.17-0.31% following primary percutaneous coronary intervention. Survival to 1 month without intervention is 6%. We report a case of a 60-year-old male, admitted in a peripheral hospital with acute anterior wall myocardial infarction. He was thrombolized with streptokinase. He developed breathlessness at rest and shifted to our hospital for further management. On evaluation in intensive care unit found to have VSR. The patient was in cardiogenic shock. The ventricular septal rupture was successfully closed with a septal occluder device. After which the patient stabilized hemodynamically and was discharged after 8 days.

Keywords: Ventricular septal rupture; myocardial infarction; mechanical complication.

*Corresponding author: E-mail: singhgs269@yahoo.com;

ABBREVIATIONS

AWMI : Anterior wall myocardial infarction;
STEMI : ST-elevation Myocardial Infarction;
VSR : Ventricular Septal Rupture;
CABG : Coronary Artery Bypass Graft surgery.

1. INTRODUCTION

The rupture of acutely infarcted tissue or tearing is the most dramatic complication of ST-elevation myocardial infarction (STEMI). The clinical characteristics of these lesions vary considerably and depend on the site of rupture, which may involve the free wall of either ventricle, the interventricular septum, or the papillary muscles. The overall incidence of these complications, although difficult to assess because clinical and autopsy series differ considerably, appears to have decreased initially with the introduction of reperfusion therapy and subsequently decreased substantially with the widespread adoption of primary percutaneous coronary intervention (PCI). The incidence of VSR following ST-segment elevation MI has decreased from 1-3% in the pre-reperfusion era to 0.17-0.31% following primary PCI. Primary PCI, by early reperfusion of the infarct-related artery prevents development of VSR by salvaging myocardium and limiting infarct expansion [1-5]. Survival to 1 month without intervention is 6% [1-5].

2. CASE REPORT

A 60-year-old male was admitted to a peripheral hospital with acute onset of chest pain. The electrocardiogram showed acute anterior wall myocardial infarction (AWMI). He was thrombolized with streptokinase but developed breathlessness at rest with decrease in oxygen saturation. He was shifted to our hospital in the evening on inotropic support and oxygen. On examination, pulse was 102/min, blood pressure was 100/56 mmHg on inotropes. On respiratory system examination, bilateral basal crepitations were present. Arterial blood gas showed hypoxia. Echocardiography showed ventricular septal rupture of 11 mm. Blood pressure was stable on inotropes. Cardiac surgery opinion was taken, Coronary artery bypass surgery (CABG) was going on in their operation theater. Other options were explained to the relatives. Patient was taken in cathlab with IABP standby. Right femoral artery/ Vein and left femoral artery access obtained. Hemodynamics showed left ventricle end-diastolic pressure – 30 mmHg, pulmonary artery pressure was 56/30 mmHg (44mean), aortic pressure was 100/56 mmHg with QP/QS-2.1. Coronary angiogram showed left anterior descending artery (LAD) occlusion. Left ventricular angiogram showed defect of 13.4 mm in the interventricular septum. As done in routine



Fig. 1. Ventricular septal rupture (defect) seen in left anterior oblique(LAO) cranial view

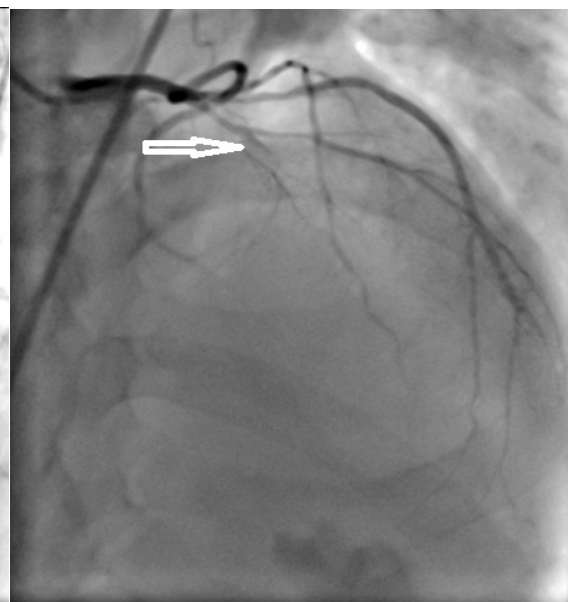


Fig. 2. Left coronary angiogram in PA cranial view occluded LAD (marked by an arrow)

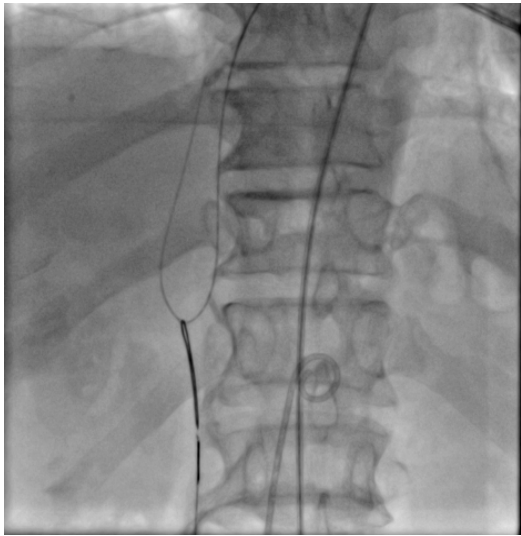


Fig. 3. Arteriovenous loop is being prepared

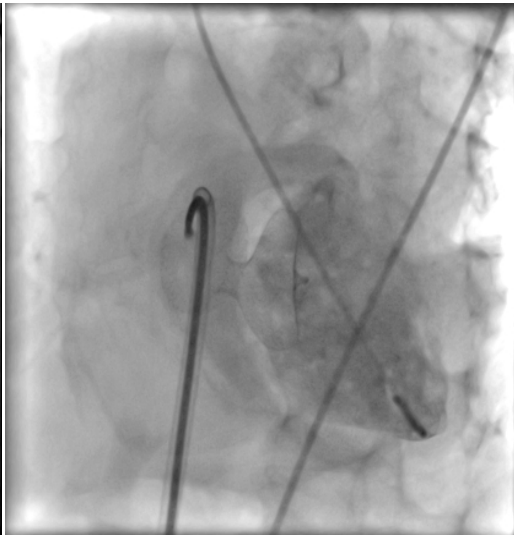


Fig. 4. Deployment of the device across the VSR without release

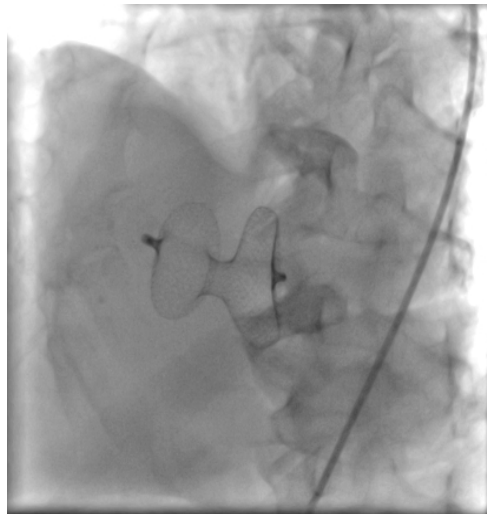


Fig. 5. Position of the device in the LAO cranial view after release

ventricular septal defect closure, arteriovenous loop was prepared. The defect was closed with COCOON septal occluder device of 20 mm.

There was no flow through the defect on the LV angiogram and on echocardiography. After the procedure the patient was observed in intensive care unit. Hemodynamics improved and the patient was discharged after 8 days. Left anterior descending territory was non - viable on Positron emission tomography (PET) scan, done after 5 days of discharge. The patient is asymptomatic on subsequent follow-ups.

3. DISCUSSION

Transmural infarction in the acute myocardial infarction leads to mechanical complications like ventricular septal rupture and free wall rupture. The perforation can range in length from one to several centimeters. It can be a direct through-and-through opening or more irregular and serpiginous. Rupture of the septum with an anterior myocardial infarction tends to be apical in location, whereas inferior infarctions are associated with perforation of the basal septum and have a worse prognosis than those in an anterior location. Advanced age, female sex,

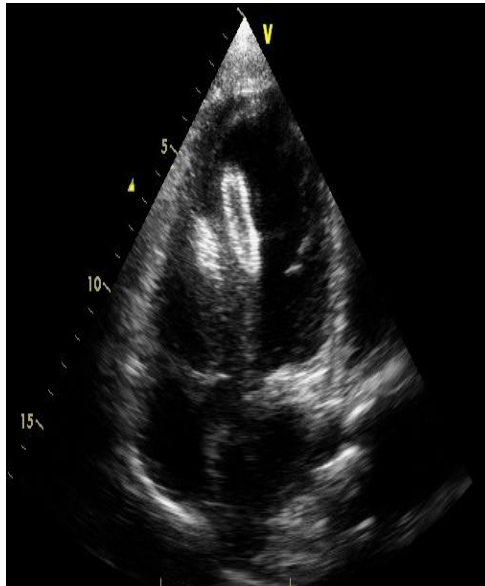


Fig. 6A. Echocardiography in apical 4 chamber view showing device *in situ*

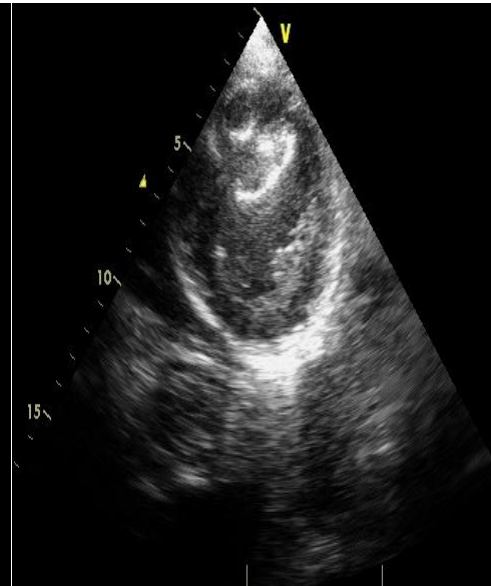


Fig. 6B. Echocardiography in Parasternal short axis view showing device *in situ*

chronic kidney disease and lack of development of a collateral network are associated with increased risk of rupture. Myocardial preconditioning induced by previous ischemia, patients with evidence of hypertension, diabetes mellitus, chronic angina, or previous myocardial infarction are less likely to develop VSR [6]. Rupture of the interventricular septum after STEMI carries a poor prognosis, with a mortality of 40% to 75% [7]. The development of a new, harsh, loud holosystolic murmur heard best at the lower left sternal border, usually accompanied by a thrill, characterizes a ruptured interventricular septum. Biventricular failure generally ensues within hours to days. The defect can also be recognized by echocardiography.

The likelihood of survival depends on the degree of impairment of ventricular function and the size of the defect, but because the rupture site can expand, prompt repair is necessary even in hemodynamically stable patients [8]. Septal rupture is most often repaired surgically, although transcatheter closure may be considered in selected patients, particularly when the patient is deemed inoperable and the anatomy is amenable to the application of a closure device [9]. In the largest study of 29 patients, successful device deployment was achieved in 25 of the 29 (86%). The 30-day survival rate was only 35% [10]. In another study of 18 patients, device was successfully deployed

in 16 of 18 patients (89%). The 30-day mortality rate was 28% [11]. Several case reports have described the use of hemodynamic support for the management of hemodynamic dysfunction through the use of an intra-aortic balloon pump (IABP), an axial flow pump, or a Tandem Heart, with various results [12]. Although worldwide data is available in the form of case reports and case series, Indian experience includes a few case reports and small case series [13-15].

4. CONCLUSION

Ventricular septal rupture is a rare but lethal mechanical complication of myocardial infarction. Surgical repair with concurrent CABG is still the gold standard, but in critically ill patients or in patients with multiple comorbidities the application of this therapy may not be reasonable. In these selected patients percutaneous closure of the VSR can be done.

CONSENT

Informed written consent was obtained from the patient for publication of this report and any accompanying images.

ETHICAL APPROVAL

As per international standards, ethical approval has been collected and preserved by the author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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