Case study

Successful percutaneous device closure of ventricular septal rupture in a patient with Acute AWMI and cardiogenic shock

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 MI in the pre-reperfusion era to 0.17-0.31% following primary PCI. Survival to 1 month without intervention is 6%. We report a case of a 60-year-old male, admitted in 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. Ventricular septal rupture was successfully closed with a device. After which patient stabilized.

Keywords: Ventricular septal rupture; Myocardial Infarction; Mechanical Complication

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

Introduction:

The rupture of acutely infarcted tissue or tearing is the most dramatic complication of 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 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).

Case Report:

60-year-old male admitted to peripheral hospital with acute onset of chest pain. Electrocardiogram showed 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 ionotropic support and oxygen. On examination, pulse was 102/min, blood pressure was 100/56 mmHg on inotropes. On respiratory system examination, bilateral basal crepts 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, 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 LV end-diastolic pressure - 30mmhg, PA- 56/30 mmHg (44mean), aortic pressure- 100/56 mmHg with QP/QS-2.1. Coronary Angiogram showed Left anterior descending artery occlusion. Left ventricular angiogram showed defect of 13.4 mm in the interventricular septum. As done in routine VSD closure, AV loop was prepared. The defect was closed with COCOON ASD device of 20 mm. There was no flow through the defect on 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 PET scan, done after 5 days of discharge. The patient is asymptomatic on subsequent follow-ups.

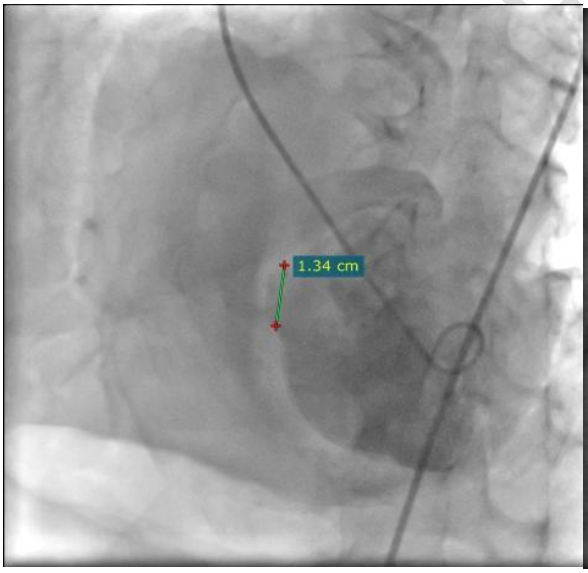

Figure 1: Ventricular septal rupture (defect) seen in LAO cranial View

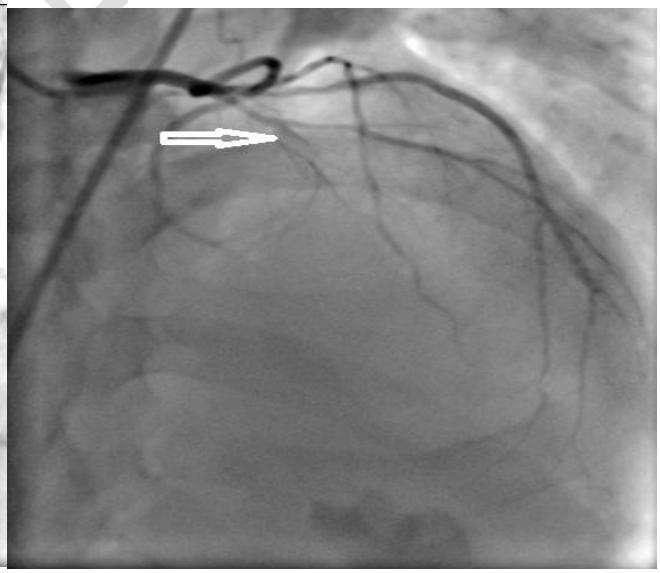

Figure 2: Left coronary angiogram in AP cranial view occluded LAD (marked by an arrow)

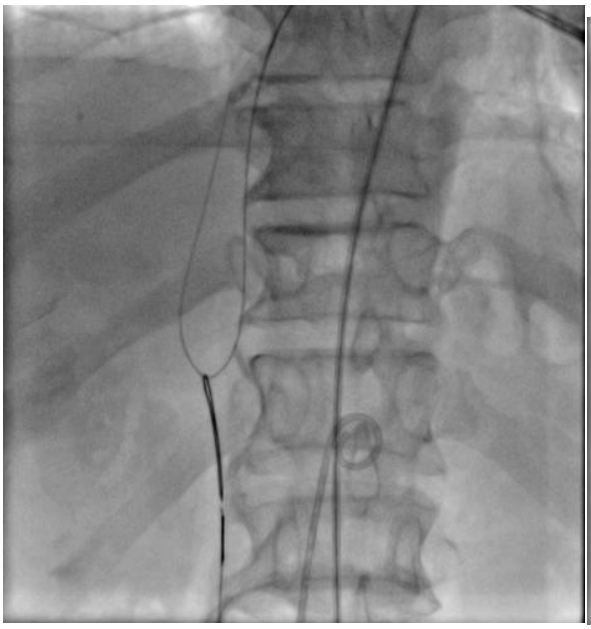

Figure 3: AV loop is being prepared

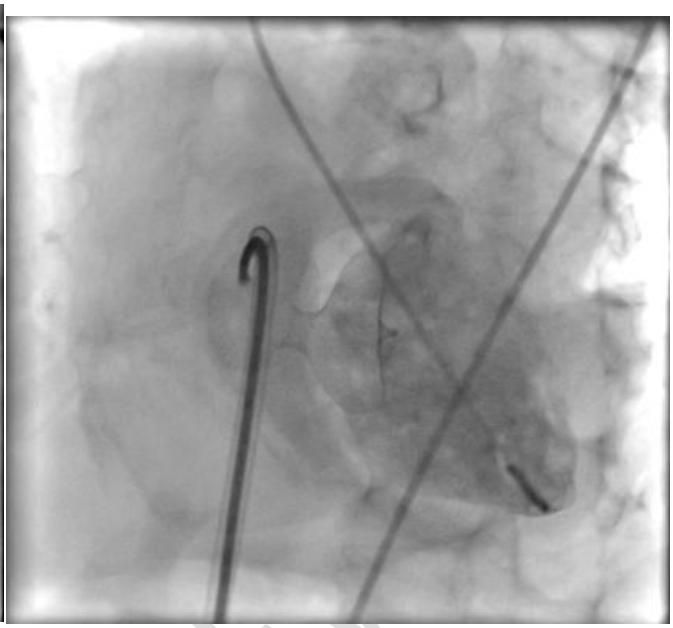

Figure 4: Deployment of the device across the VSR Without release

Figure 5: Position of the device in the LAO Cranial view after release

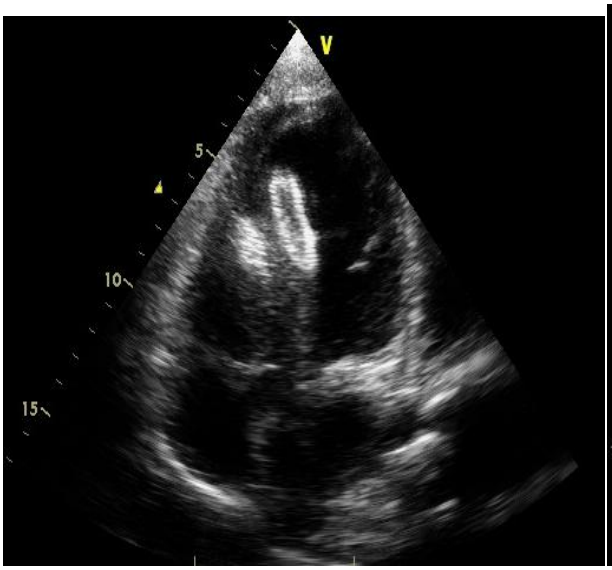

Figure 6A: Echocardiography in apical 4 chamber View showing Device in situ

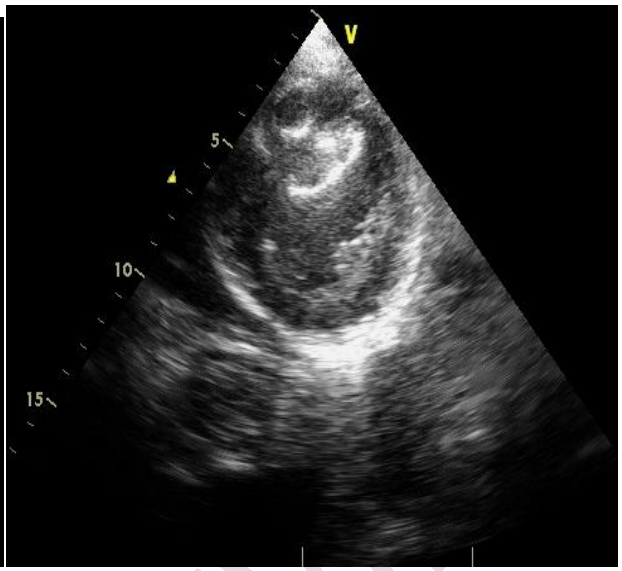

Figure 6B: Echocardiography in Parasternal short Axis view showing device in situ

Discussion:

Transmural infarction in the Acute Myocardial infarction leads to the 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, 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 MI are less likely to develop VSR (6). Rupture of the interventricular septum after STEMI carries a poor prognosis, with 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 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 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).

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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.

Informed Consent:

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

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