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Case Report
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Late Presenting Anterior STEMI Leading to Apical Ventricular Septal Rupture with Spontaneous Reperfusion of LAD

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Abstract

Ventricular septal ruptures, in the era of contemporary PCI and early revascularization of acute myocardial infarctions, are rare in incidence. We present an 86 year old female who presented with late anterior STEMI and ventricular septal rupture despite an angiographically patent LAD.

Case Presentation

An 86 year old frail Caucasian female presented to the emergency department with complaints of chest pressure and abdominal pain over approximately one week duration. The abdominal pain was epigastric and progressed in severity becoming constant the day of arrival. Her chest pain was located centrally and radiated towards her upper back described as moderate in intensity. There were no aggravating or relieving factors for the patient's symptoms. The patient's history includes hypertension, hypothyroidism, gastroesophageal reflux disease, gout, and anxiety disorder and breast cancer. She previously underwent bilateral mastectomy in addition to two cycles of chest radiation and chemotherapy. Her functional status is significant for being wheelchair bound due to severe Parkinson's disease.

Physical examination showed a frail patient complaining of persistent chest and epigastric discomfort. Vital signs showed blood pressure of 112 mmHg/70 mmHg, heart rate of 105 bpm, respiratory rate of 18 respirations per minute, and oxygen saturation of 95% on room air. She was alert and oriented. Heart sounds revealed a harsh IV/VI systolic murmur with radiation to axilla. The breath sounds were equal in both lungs and there were no signs of respiratory distress. The abdomen was soft with mild tenderness in the epigastric area and normal bowel sounds. JVD was elevated with no lower extremity edema. EKG revealed normal sinus rhythm with ST segment elevations in leads V3 to V6. Anteroposterior chest radiograph showed increased pulmonary vascular markings compared to imaging done eight months prior. Troponin I level was 1.99 ng/mL. A STEMI code was called and the patient was assessed by the cardiology team.

The decision was made to take the patient emergently for cardiac catheterization. A loading dose of ticagrelor 180 mg and heparin 5000 u of IV unfractionated heparin were given. Initial left ventriculogram was done in both RAO and LAO projections which showed apical septal ventricular defect (Figure 1). A right heart catheterization was then conducted which showed severely reduced cardiac output of 1.45 on thermodilution (cardiac index of 0.75.). A shunt run was completed which showed right atrial saturation of 42%, right ventricle saturation of 68%, and pulmonary artery saturation of 72% consistent with ventricular septal defect. Calculated Qp/Qs ratio was 2.74 indicating severe left to right shunting. Angiographically there was 70% stenosis of the mid left anterior descending artery with excellent TIMI 3 flow (Figure 2). Intra-aortic balloon pump was inserted and she was brought to the cardiovascular intensive care unit. Transthoracic echocardiogram confirmed apical septal defect with left to right shunting based on color and continuous wave Doppler (Figure 3 and 4). Due to the overwhelming cardiogenic shock with left to right shunt and poor metabolic equivalents she was deemed not a candidate for surgical intervention. Palliative care was pursued by the family and the patient expired four days later.

Discussion

Ventricular Septal Ruptures (VSR) has become an increasingly rare phenomenon seen as a consequence of Acute Myocardial Infarctions (AMI). From a composite review of cardiac rupture

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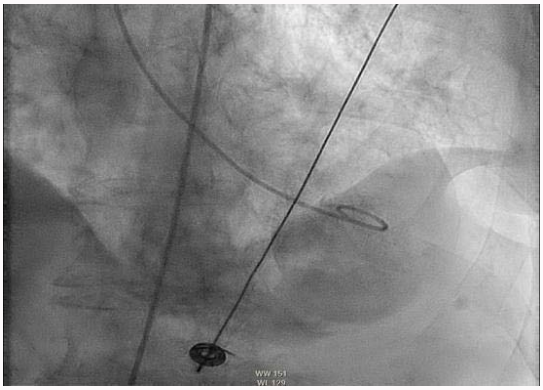

Figure 1: RAO projection of left ventriculogram showing apical VSD.

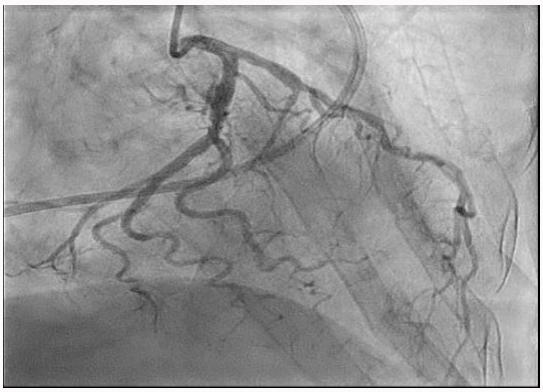

Figure 2: Coronary angiogram showing stenosis of mid left anterior descending artery.

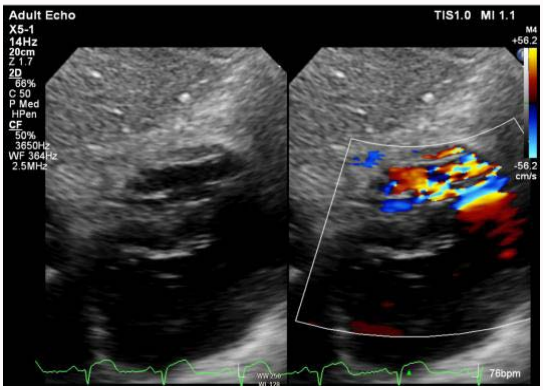

Figure 3: Subcostal view on TTE showing left to right shunting within the apical VSD.

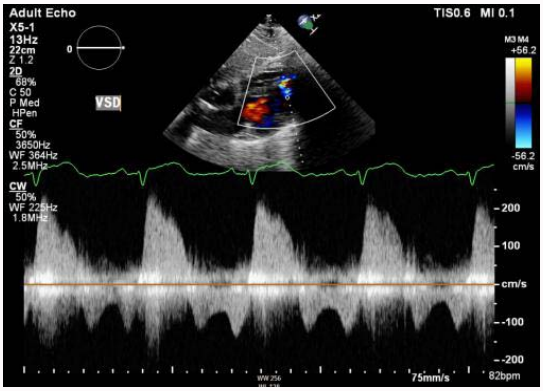

Figure 4: Subcostal view on TTE with continuous wave Doppler through apical VSD.

cases in the United States from 1996 out of 350,755 patients presenting with AMI, less than 1.0% developed ventricular rupture [1]. A more recent review of VSR has shown an improvement in cases with the incidence being between 0.17 and 0.31% of patients presenting with AMI [2]. This decrease is attributed to formalization of percutaneous coronary intervention protocols and guidelines in regards to patients with STEMI. Significant delay in reperfusion in the setting of STEMI has been a well established precursor to VSR [3]. Pathologically the septal perforation is seen during the first week of AMI and in most cases patients have total occlusion of the infarct related artery [4]. Although the incidence of VSR is quite low, patients with presentation of AMI and VSR have an elevated mortality of 41% to 80% in a recent case series with no improvement despite advances in PCI and STEMI protocols [5]. There are many variables that elevate the risk of VSR with retrospective data showing higher incidences with certain variables including anterior infarctions, female gender, and age over 70 years among others. Anterior infarctions typically result in apical location of VSR. Apical ruptures that were complications from LAD disease had thinner margins and were likely to be surrounded by the septum [6].

The optimal timing of surgical repair is still not clearly defined due to hemodynamic instability of patients. In post AMI with VSR the majority of cases are in urgent need of surgical intervention due to unstable hemodynamics which unfortunately has an elevated operative mortality if done within 7 days of the myocardial infarction. Current European guidelines recommend a delayed elective repair approach to avoid higher mortality in recent AMI [7]. The delay in surgical approach is to allow for some degree of myocardial healing in the setting of acute MI with increased inflammation. For surgical repair this then allows for a more stable rim of the VSR itself. VSR with significant left to right shunting can lead to cardiogenic shock. When managing a patient in cardiogenic shock with large left to right shunting in the setting of AMI, mortality is elevated up to 87% based on the SHOCK trial [8]. In a patient with poor baseline functional status, late presenting anterior STEMI and cardiogenic shock with large left to right shunting due to VSR a palliative care approach may be considered [9].

An interesting finding in this case was the lack of a totally occluded major vessel on coronary angiography. One possible mechanism is spontaneous reperfusion of the LAD. Spontaneous reperfusion has an unclear pathophysiology which is usually linked with a smaller infarct size and more favorable outcomes with less risk of adverse clinical events [10]. In this case there was no obstructive stenosis within the LAD with established TIMI-3 flow. Given the fact that the patient presented as an anterior STEMI and had sequela of transmural infarction with VSR it is unusual to see spontaneous reperfusion in this case. Possible reasoning behind this finding is a network of small vessel collaterals that were not clearly seen on coronary angiography. In addition there may be a release of fibrinolytic precursors in the setting of VSR. Alternatively, with her history of chest radiation, she may have been predisposed to VSR due to thinning of the septal wall.

Conclusion

Ventricular septal rupture, although low in incidence, is

associated with a high mortality rate. Initial management includes assessment of the degree of shunting and anatomic location of the rupture. With large left to right shunting and cardiogenic shock early initiation of vasopressors if needed and insertion of intra aortic balloon pump are standard of care. In surgical candidates, if possible, surgery should be delayed for seven days post myocardial infarction. Patients who are deemed non-surgical candidates may consider a palliative approach. Additionally a late presenting STEMI with VSR may have spontaneous reperfusion seen on coronary angiography which stems from a somewhat unclear mechanism.

Learning Objectives

Case: A late presenting STEMI presents with need for emergent coronary intervention.

1. Clinical decision making in late presenting anterior STEMI with ventricular septal rupture

2. Spontaneous reperfusion may be evident in the setting of STEMI with unclear mechanism

3. Intraprocedural decision making during STEMI with concern for VSR improved with left ventriculogram as initial image in left heart catheterization.

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