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Emergency Surgical Repair of Post Infarction Ventricular Septal Rupture

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ABSTRACT

Ventricular septal rupture (VSR) is a life-threatening complication of myocardial infarction (MI). Surgery remains the only option; however it is still a challenging. Patients survive following medical management have poor outcome, so, its result is disappointing. Primary percutaneous coronary intervention (PCI) can be reduced VSR incidence. Medical treatment has high mortality, and early surgery is recommended to prevent hemodynamic deterioration. However, surgery also associated to a high of mortality rate. Transcatheter device closure is an option in critical cases.

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Introduction:

VSR (Post-MI) incidence is 1–2%. Early post-infarction interventions like; thrombolytic therapy, primary PCI, and urgent CABG decrease its incidence. Anterior MI causes apical or anteroseptal VSR (2/3), and posterior MI causes basal or posteroseptal VSR (1/3) (1, 5).

VSR developed from hours to 2 weeks after AMI. It is caused by complete obstruction of a single coronary artery with poor collaterals. The prognosis of untreated VSR is extremely poor. Congestive heart failure (CHF), cardiogenic shock developed early leading to death. Posterior MI may be associated with severe mitral regurgitation (MR) leading to CHF, and pulmonary edema. The degree of left-right shunt depends on its size and pressure gradient across the septum. If VSR is large, right ventricle (RV) cannot tolerate sudden increase in volume load, and develops RV failure. So, severe biventricular failure is not uncommon with VSR (5).

Case report

A 49-years old male complaining of sudden onset chest pain was referred to our cardiac center. ECG was revealed

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acute inferior ST- segment elevation (STEMI). Relatives denied previous history of any chest pain or CCU admission. The patient was a heavy smoker, diabetic (type I) with a family history of coronary heart disease (CAD). On physical examination, the patient was restless, distress, and a pansystolic murmur was auscultated. The blood pressure was 80/50 mm Hg, pulse 125 bpm, respiratory rate 24 bpm. His skin was cool and poorly perfused with shallow respiration, and weak peripheral pulses. Laboratory investigations were showing troponin (0.170 ng/mL), serum creatinine level (1.3 mg/dL), and MB-CK level (229 U/L). Coronary angiography was revealed total occluded parosteal right coronary artery (RCA), and primary PCI was performed. Trans-Thoracic Echography (TTE) demonstrated a VSR (15mm) located basal infer septal at level of mitral valve, moderate MR, and EF < 25% (Figure.1). Patient was in cardiogenic shock, and intra-aortic balloon pump (IABP) was inserted. Chest X-ray showed increased cardiothoracic ratio with lung congestion (Figure.2). Medical management is aimed to improve cardiac output and reduce shunt. Inotropes, diuretics, and IABP are often used.

Patient was urgently transferred to operative room. Median sternotomy, then cardiopulmonary bypass (CPB) with moderate hypothermia (32°C) was established after cannulation of aorta, SVC, and IVC with tapes around cavae. IABP was stopped then aortic cross-clamp was placed, and antegrade blood cardioplegic arrest was induced. Deep left pericardial traction sutures were placed to facilitate exposure of posterior wall of the heart. We made longitudinal incision lateral and parallel to posterior descending artery (PDA) and identified a VSR in middle level of posterior wall. Stay sutures were placed to expose the edges of the defect. The necrotic tissue was debrided, revealing a defect 2 cm. VSR closure without tension employed using a bovine pericardial patch placed on LV side, and Teflon felt pledgets placed on RV and RV free wall. Ventriculotomy was closed by double layer buttressed with Teflon felt. Biological glue was used to ensure complete hemostasis (Figure.3, 4). TTE revealed no residual shunt; EF 35%, mild to moderate MR on 1st POD. Patient was discharged from hospital on 15th POD.

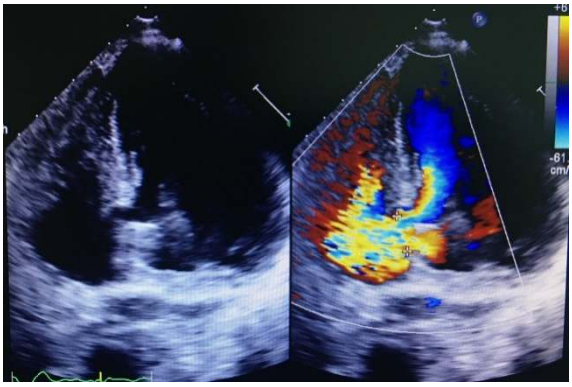

Figure1: Pre-operative transthoracic echocardiogram shows a ventricular septal rupture with left-to right shunt flow.

Figure 2: CXR was showing pulmonary edema

Discussion

VSR is characterized by poor ventricular function. Ischemia caused by aortic cross clamp, and ischemic reperfusion injury has a poor outcome. Adequate myocardial protection during surgery is considered to be the cornerstone for a better outcome (6-9).

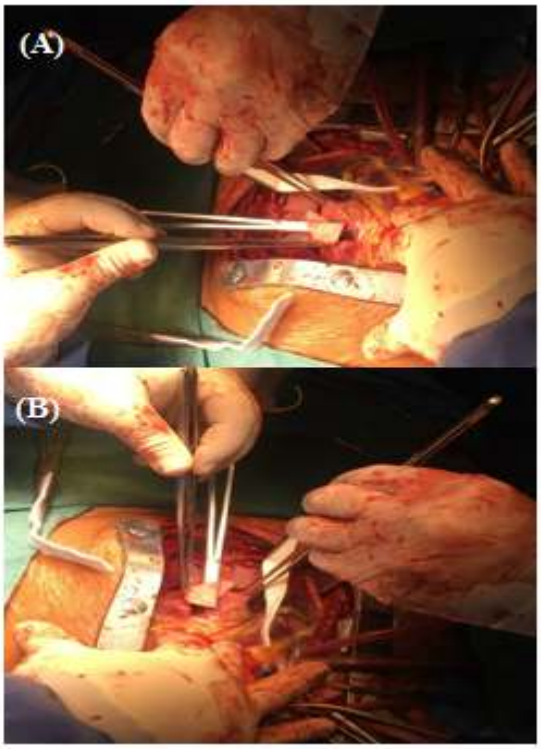

Figure 3: (A) Intraoperative bovine patch closure of VSR. (B) Teflon strips reinforced linear ventriculotomy closure.

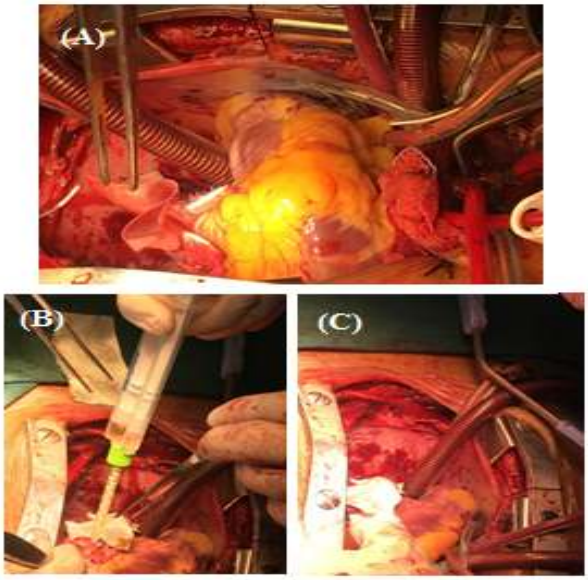

Figure 4: Hemostasis with Surgically and Bio Glue

So that surgery is very high risk, and tries to do the best during myocardial preservation.

VSR is a mechanical complication of MI with 50% surgical mortality. Many factors contribute to poor surgical outcome like; emergency, MVD, posterior VSR, incomplete revascularization, intractable shock and MOF (6). In our case, the risk factors were emergency, cardiogenic shock, and posterior VSR.

VSR associated with cardiogenic shock has a very bad prognosis. Achieving hemodynamic stability before surgery may be beneficial, however prolonged attempts to improve patients' hemodynamics have drawback on delaying surgical intervention (2). Preoperatively, high inotropics support and placement of IABP was essential to decrease left - right shunt, and MOF, then emergency surgical intervention was done without any delay or escaping.

VSR repair is still a challenging with a risk of residual shunt and high mortality. CABG can be done safely to control the risk of CAD; especially in MVD, it should be routinely done (3-4). The role of primary PCI or CABG in cases of VSR closure is debatable, as myocardial damage is trans-mural with residual viability questionable. However, in our case PCI to RCA was done.

Conclusion

Inspire post-infarction VSR has high surgical mortality, emergency surgical closure is mandatory after optimizing medical and mechanical support.

Ethics approval and consent to participate:

Patient confirms that have read and understood the information about the research as provided in the participant information sheet inside his file. Ethical committee approved that case report for publication. Patient signed agreement to participate the research, accepted to publish imaging from operation. The study conformed to the principles of "Declaration of Helsinki" and the investigator followed the appropriate safeguards regarding the rights and welfare of the human participants that have been included in the performed study. The formal approval and

permission from our Cardiac Center, and Heart Team Meeting was taken.

Consent for publication: It was obtained written consent from patients.

Availability of Data and Material: It is available from recording files and data at cardiothoracic surgery departments and cardiology clinics for follow up.

Competing interest: None to declare

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Abbreviations

VSR/D: ventricular septal rupture/ defect, AMI: acute myocardial infarction, STEMI: ST segment elevation MI, CAD: coronary artery disease, CABG: coronary artery bypass grafting, PCI: percutaneous coronary intervention, IABP: intra-aortic balloon pump, LAD: left anterior descending artery, CX: circumflex, RCA: right coronary artery, PDA: posterior descending artery, MVD: multivessel disease TTE: trans thoracic echo, CPB: cardiopulmonary bypass EF: ejection fraction, CHF: congestive heart failure, LCO: low cardiac output, MOF: multi organ failure, MR: mitral regurgitation, TR: tricuspid regurgitation LV: left ventricle, RV: right ventricle, LVEDP: left ventricular end diastolic pressure, POD: post-operative day.

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