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Original Article

Percutaneous closure of post-myocardial infarction ventricular septal rupture – A single centre experience

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ABSTRACT

Background: Post-infarction ventricular septal rupture (VSR) is a rare but lethal mechanical complication of an acute myocardial infarction (AMI). Survival to 1 month without intervention is 6%. Given high surgical mortality, transcatheter closure has emerged as a potential strategy in selected cases. Indian data on percutaneous device closure of post AMI-VSR is scarce hence we report our single-centre experience with ASD occluder device (Amplatzer and lifetech) for closure of post-AMI VSR.

Methods and results: In this single-centre, retrospective, cohort study, patients who underwent transcatheter closure of post-MI VSR between 2005 and 2015 at KIMS Hospital were included. Primary outcome was mortality rate at 30 days. Seven patients were included in the study (mean age, 58.29 ± 9.8 years). 5 patients had anterior wall myocardial infarction (AWMI) & 2 had inferior wall myocardial infarction (IWMI). None of the patients received thrombolytic therapy. Device was successfully placed in 5 patients (71.4%) with minimal residual shunt in 2 patients (40%). Out of 7 cases 2 patients survived (29% survival rate) and are doing well on follow up at 1 and 5 years respectively. Cardiogenic shock, IWMI and serpigenious form of VSR were associated with poor outcomes. Delayed revascularization (PCI) was associated with better outcomes.

Conclusion: Percutaneous closure is a potential technique in a selected group of patients. The presence of cardiogenic shock, IWMI and serpigeneous form of VSR constitutes important risk factors for mortality. Device implantation is in general successful with few procedure-related complications and should be applied on a case-by-case basis.

1. Introduction

Post-infarction ventricular septum rupture (VSR) is a potentially lethal mechanical complication of an acute myocardial infarction (AMI). Due to the implantation of early revascularisation strategies, the incidence of post-infarction VSR has decreased from 1–2% to 0.25–0.31%.[1] However, when it does occur is commonly associated with extensive comorbidities, and results in poor cardiac output, multiorgan failure, and death. When conservative treatment is applied, mortality rates are as high as 87–100% within 2 months of diagnosis.[2,3] Expert opinion and professional guidelines suggest that immediate closure, often combined with (multiple) coronary artery bypass grafting should be considered to reduce the duration of poor systemic perfusion that results from left-to-right shunting, pulmonary over circulation, and systemic hypoperfusion that may eventuate in refractory multiple organ failure and death.[4] Despite this awareness, there is a tendency for surgeons to wait several weeks before operating to allow tissue healing and more complete rupture remodelling, contributing to high inter-stage mortality and positive selection of more favourable cases. Due to the high mortality rate, less invasive alternative treatments, such as the use of percutaneous occluders, have been investigated. The advent of the Amplatzer family of ventricular septal defect (VSD) closure devices offers a potentially attractive alternative to surgical repair. A few case reports in Indian literature has been published but as such no case series reported.[5,6] Though data is available in form of case reports and series world-wide.[7,8] We hereby report our case series on percutaneous closure of post MI VSR using the ASD occluder device (Amplatzer and lifetech) who presented between 2005 and 2015.

2. Method

Device closure for VSR after acute MI has been attempted at our centre since December 2005. We analysed the case records available from the first case in December 2005 until June 2015. Data

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was collected regarding patient demographics, clinical features, pre-procedural clinical condition, echocardiographic features, procedural characteristics, procedural complications, in-hospital and 30 days mortality and long term follow up result. Cardiogenic shock was defined according to the Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock (SHOCK) trial.[9] Coronary artery disease was defined as >70% stenosis in 1 of the 3 major epicardial coronary arteries.

As per hospital data records from 2005 to 2015, 25 patients were admitted with post MI–VSR. Out of these 7 cases (non consecutive) underwent percutaneous device closure and 11 cases underwent surgery.

Table 1
Demographic data.

Demographic	Data
Total cases	7
Male:female	2:5
Mean age (years)	58.29 ± 9.8
Diabetic	4
Hypertensive	5
Anterior MI	5
Inferior MI	2
Mean duration from MI onset to presentation (hours)	22.14 h
Mean duration from MI to procedure (days)	5.29 ± 2.73
Cardiogenic shock	4 (57.1%)

3. Clinical parameters of the cases studied

In this single-centre, retrospective, cohort study where 7 non consecutive cases (4 females and 3 males) of post-MI VSR were included. The demographic data is summarised in Table 1. The mean age of the population was 58.29 ± 9.8 years (57.67 ± 10.2 years in males and 58.75 ± 11.08 years in females). Majority of the patients in our series had an anterior wall MI (5 of 7 cases; 71.43%) and the remaining 2 had an inferior wall MI. All the patients did not receive thrombolytic therapy or any other form of intervention for the AMI. All cases had late presentation (>12 h to >38 h from the onset of chest pain). The mean duration from onset of pain to presentation at our centre was 22.14 h. Presence of ventricular septal rupture was identified clinically with the presence of a pan-systolic murmur along the lower left sternal border and confirmed by performing an echocardiogram (Fig. 1a). All patients were managed by placing an intra aortic balloon pump (IABP) for afterload reduction and consequent reduction of the left to right shunt. 4 patients presented with cardiogenic shock (57.14%) and required inotropic support with dopamine and noradrenaline. Of the two patients with IWMI one developed complete heart block and needed temporary pacemaker insertion (TPI) and one needed Continuous renal replacement therapy (CRRT) for acute kidney injury. Mean duration from acute MI to procedure for attempted device closure was 5.29 ± 2.73 days.

4. Procedure

The technique of percutaneous closure of a VSR is based upon the well proven and widely used percutaneous technique for closing a congenital ventricular septal defect. Transesophageal echocardiography (TEE) with colour Doppler is used to determine the size and anatomy of the VSR (Fig. 1b). Left Ventricular angiogram was done to determine the exact location of the VSR. Cannulation of the right femoral artery and right internal jugular vein is performed using the Seldinger technique. A guidewire (035″ Terumo glidewire) is introduced from the femoral artery, through the aorta into the left ventricle and is advanced through the VSR into the right ventricle and pulmonary artery. A second snaring wire is introduced through the vein to connect to the guidewire in the pulmonary artery. By retracting the snared wires, the guidewire now forms an arteriovenous (AV) loop (Fig. 2a). The delivery sheath is advanced from the venous side loop over the guidewire through the VSR into the left ventricle. Correct positioning of the delivery sheath is confirmed in fluoroscopy/TEE. The guidewire is then retracted leaving the delivery sheath in position. After echocardiographic confirmation an ASD occluder device (liftech in 3 cases and amplatzer in 4 cases) was deployed across VSR using the delivery sheath. The distal disc is opened, the device is retracted, so that it will be secured against the septal tissue at the side of the left ventricle. The second (proximal) disc is opened on the right ventricular side by further retracting the delivery sheath (Fig. 2b). Correct positioning of the device and closure is confirmed by echocardiography and/or fluoroscopy. If placement is satisfactory, the occluder is released. Post procedure Left ventricular angiography & Echocardiography was done to confirm the position and to rule out presence of any residual shunt. In all the cases, we made use of the femoral-jugular mode of access and created an AV loop. The veno-venous loop though described in literature was not used in this study. VSR Closure in all these cases was attempted using an ASD occluder device (3 Lifetech and 4 Amplatzer), the size depending upon the size of the VSR.

5. Results

All patients included in this study were cases with VSR in whom previous attempts at closure had not been done (primary closure). Of the 7 cases in this study the device was successfully placed in 5 patients (71.4%). Post procedural result was good with a minimal residual shunt in 2 patients (40%). Out of 7 cases 3 patients were

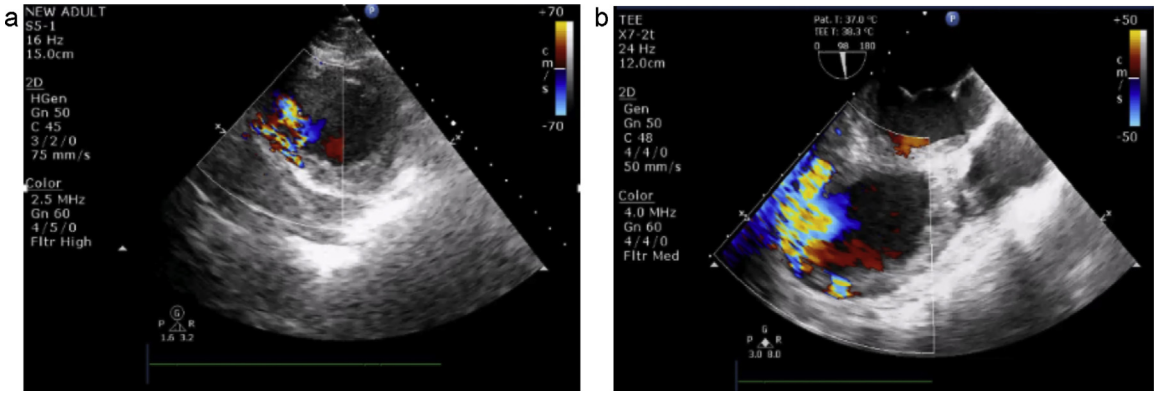

Fig. 1. (a) PSAX and (b) transesophageal echocardiogram showing the VSR in a patient with AWMI.

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