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Research Article

Ventricular Septal Rupture Complicating Acute Myocardial Infarction in a Tertiary Care Hospital of Nepal

Abstract

Background: Ventricular septal rupture is a rare but fatal mechanical complication of acute myocardial infarction. Although the incidence has decreased, the mortality rate from ventricular septal rupture has remained extremely high.

Objectives: The aim of this study was to assess the patient with acute myocardial infarction complicating with ventricular septal rupture and to identify the risk factors for ventricular septal rupture in a tertiary level hospital of Nepal.

Patients and Methods: This is a retrospective analysis of 11 patients who were diagnosed as ventricular septal rupture complicating acute myocardial infarction in College of Medical Sciences & Teaching Hospital, Bharatpur, Nepal.

Results: All (100%) patients were female with mean age of 65.8±9.3 years. Three patients (27.3%) were smokers, seven (63.6%) were hypertensive, and four (36.4%) were diabetic. None of our patients had previous history of coronary artery disease. Nine (81.8%) patients had ventricular septal rupture in apical septum and two (18.2%) in basal septum. Since there was no backup cardiac surgery facility available in our hospital, all patients were managed conservatively. In-hospital mortality was 90.9%.

Conclusions: Ventricular septal rupture following acute myocardial infarction has very high in-hospital mortality and is more common in female patients with no previous history of coronary artery disease. Rupture in apical septum is more common than basal septum rupture.

Introduction

Ventricular septal rupture (VSR) is a rare but fatal complication of acute myocardial infarction (AMI). VSR was first described by Latham first at autopsy in 1847 [1]. However, first ante-mortem diagnosis of post MI VSR was made by Brunn in the year 1923 [2]. In the pre-fibrinolytic era, the incidence of VSR was 1-2%, however, reperfusion therapy has decreased the incidence of VSR which is now amounted to 0.2% [3,4].

Despite decreasing incidence, the mortality rate from VSR has remained extremely high. When conservative treatment is applied alone, the mortality rate reaches 90-95%, while for surgical intervention it varies from 19% to 60% [4]. Therefore, current guidelines from the American College of Cardiology Foundation and American Heart Association (ACCF/AHA) recommend emergent surgical repair regardless of hemodynamic stability at the time of diagnosis [5].

This study was aimed to assess the patient with AMI complicating with VSR and to identify the risk factors for VSR in a tertiary level hospital of Nepal.

Patients and Methods

A retrospective data analysis was performed on 11 patients diagnosed as VSR following AMI who presented or referred to College of Medical Sciences & Teaching Hospital (CMS-TH) till June 2016. Seven patients were referred from outside and 4 visited to our emergency room directly. The AMI diagnosis was based on clinical ischemic symptoms, electrocardiographic changes, and/or positive levels of biomarkers of myocardial necrosis. VSR was diagnosed in CMS-TH by transthoracic echocardiography. Baseline patient characteristics, clinical characteristics upon admission, coronary interventions, location of coronary artery lesion, left ventricular ejection fraction, location of ventricular septal defect and in-hospital mortality were analyzed. Ethical committee had approved for the study. Standard statistical software SPSS (version 20 for Windows) was used for calculations. Quantitative variables are

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presented as mean ± standard deviation. Categorical variables are presented as both absolute and relative (%) values.

Results

A total 11 patients were diagnosed as VSR complicating AMI. Interestingly all (100%) patients were female. Mean age was 65.8±9.3 years. Previous history of coronary artery disease (CAD) was absent in all cases. 27.3% were smokers, 63.6% were hypertensive and 36.4% of patients were diabetic. On arrival to our hospital, 72.7% of the patients were in Killip class IV. Baseline characteristics are shown in table 1.

Coronary angiography was performed in three patients. Two patients had single vessel disease (SVD) and one had triple vessel disease (TVD). Culprit vessel was the left anterior descending (LAD) artery in 66.7% cases and the right coronary artery (RCA) in 33.3% cases. One patient underwent primary PCI and stenting to the LAD who was diagnosed to have VSR after stenting.

Transthoracic echocardiography was performed to diagnose VSR. Mean left ventricular ejection fraction (LVEF) was 45.7±4.5%. VSR was seen as a defect in interventricular septum with significant flow between the chambers. Regarding the location of the VSR, nine (81.8%) patients had VSR in apical septum. These patients presented with acute anterior wall MI. Rest two (18.2%) patients had VSR in basal septum [Figures 1,2].

Ten (90.9%) patients died during hospitalization. Most of them presented in cardiogenic shock and all developed shock during hospitalization. They were managed conservatively with inotropic support and intravenous nitrates. None of our patients could undergo surgical repair. Only one patient who had acute inferior wall MI with basal septum VSR was discharged home uneventfully. She was treated for 10 days with conservative measures. She had TVD and advised for CABG and septal repair but she refused. She was doing well till one month follow-up. None of the patients underwent thrombolytic therapy. No patients were placed on IABP during hospitalization. Only one patient received PCI in which CAG showed 100% thrombotic occlusion of the mid LAD. Unfortunately, six hours later she developed cardiogenic shock and there was a harsh pansystolic murmur at left lower sternal boarder and echocardiography showed VSR in apical septum. She died three days later.

Table 1: Baseline characteristics and in-hospital mortality.

Variables	Number of patients (%)
Age (years)	65.8±9.3
Female sex	11 (100%)
Diabetes mellitus	4 (36.4%)
Hypertension	7 (63.6%)
Smoking	3 (27.3%)
Previous CAD	0
Killip class (on presentation)	
Class III	3 (27.3%)
Class IV	8 (72.7%)
CAG	3
SVD	2 (66.7%)
DVD	0
TVD	1 (33.3%)
Culprit vessel	
LAD	2 (66.7%)
RCA	1 (33.3%)
LCX	0
LVEF	45.7±4.5%
Location of VSR	
Apical septum	9 (81.8%)
Mid septum	0
Basal septum	2 (18.2%)
Time of arrival after symptom	
<24 hours	3 (27.3%)
>24 hours	8 (72.7%)
IABP support	0
In-hospital mortality	10 (90.9%)

CAD, coronary artery disease; CAG, coronary angiography; SVD, single vessel disease; DVD, double vessel disease; TVD, triple vessel disease; LAD, left anterior descending coronary artery; RCA, right coronary artery; LCX, left circumflex coronary artery; LVEF, left ventricular ejection fraction; VSR, ventricular septal rupture; IABP, intra-aortic balloon pulsation.

Discussion

VSR is a rare but serious mechanical complication of AMI that is, in almost all cases, fatal without early surgical intervention. It had an incidence of 1-3% in the era before reperfusion therapy, decreasing with the introduction of thrombolytic therapy [3,4].

Large area of infarction with transmural necrosis underlies rupture of the ventricular septum [6]. Anterior wall MI is associated with rupture of the apical septum like in our study where all nine patients who had VSR in apical septum were suffering from anterior wall STEMI. Whereas, rupture of the septum with an inferior wall MI tends to be basal in location [6]. Risk factors associated with the development of VSR in AMI are advance age, first MI, female sex, hypertension, and large infarction. Interestingly in our study, 100% patients were female and all of them had no history of previous MI. Our data, as well as reports from GUSTO-1 [7], SHOCK [8], and other studies [3,4,9], found female sex to be a risk factor for the development of VSR.

There is a bimodal distribution of septal rupture. Usually rupture occurs within 24 hours and 3-5 days after the infarction and often precipitates cardiogenic shock [6,10]. There are a few reported cases of silent myocardial infarction followed by an asymptomatic VSR or presenting as chronic congestive heart failure [11]. In our study, all cases of VSR were diagnosed within 5 days after the onset of AMI. Our patients came to hospital late, with only 3 (27.3%) arriving in less than 24 hours after the onset of AMI symptoms and rest 72.7% patients arriving in more than 24 hours of symptom occurrence. Therefore, most of them were not able to receive early revascularization and the time to the development of VSR was also longer. Complete spontaneous closure of VSR complicating AMI is extremely rare [10].

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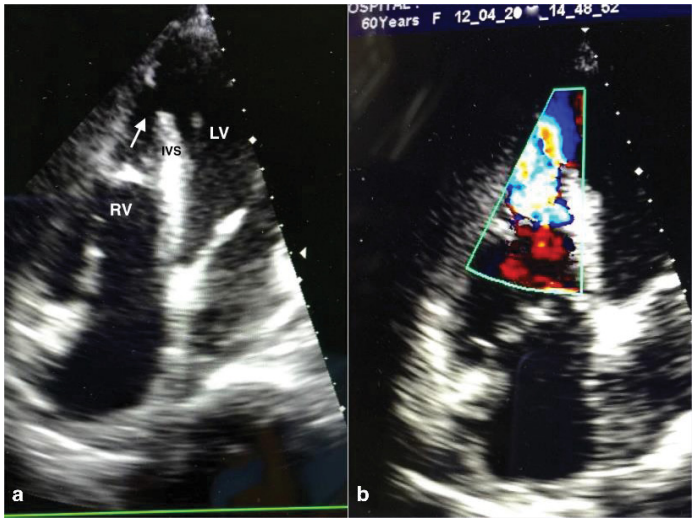

Figure 1: a) Transthoracic echocardiography in four-chamber view showing a defect in apical ventricular septum (arrow) b) Color Doppler showing left to right flow.

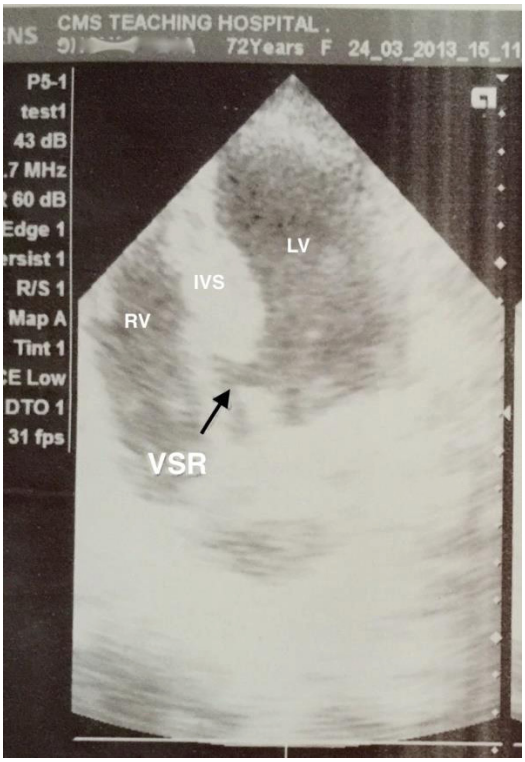

Figure 2: Transthoracic echocardiography in four-chamber view showing a defect in basal ventricular septum (arrow).

It has been shown that early treatment of MI with thrombolysis may reduce the incidence of VSR, influence the time to septal rupture and improve the outcome [10]. But conservative treatment after the development of VSR carries a high risk. When conservative treatment is applied alone, the mortality rate reaches 90-95% [4]. However, surgical management is associated with better outcomes when compared to medical therapy. Although there is a common practice to stabilize the patient for at least four to six weeks because it is believed that in earlier stage of AMI the myocardium is too fragile for the safe repair of the septal rupture and the waiting period allow the margins of the infarcted muscle to develop a firm scar to facilitate the surgical repair [3]. However, many patients died while awaiting surgery or had to undergo emergency surgery due to sudden decompensation [12,13]. Therefore, the current guidelines from the ACCF/AHA also recommend emergent surgical repair regardless of hemodynamic stability at the time of diagnosis [5]. Transcatheter device closure of VSR has emerged as a potential strategy in selected cases as an alternative to surgery. The procedure itself has a high technical success rate with a relatively low complication rate; however, it is associated with high in-hospital mortality rates when performed in the early phase [14].

Limitations

There are some limitations of this study that should be mentioned. Firstly, a small population of patients with diagnosis of VSR resulted in inadequate statistical power. The retrospective nature of the study restricts the control of confounding factors and prevents the ability to infer that obvious associations demonstrate causality. Echocardiography in the emergency room was performed in patients who had audible murmur or who were hemodynamically instable. Clinical decisions on treatment were based solely on treating physician and our patients with VSR could not undergo surgical repair due to unavailability of the surgery facility in our hospital, moreover, we did not put the patients on IABP support who were hemodynamically instable.

Conclusions

VSR complicating AMI carries a grave prognosis. Medical management alone is associated with worse outcomes. In our study, in-hospital mortality was 91%, which was due to unavailability of the efficient cardiac surgery back up. We found that VSR in AMI was more common in female patients with no previous history of CAD. Rupture in the apical septum was more common type of VSR.

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