Scientific Research Publishing

World Journal of Cardiovascular Surgery, 2021, 11, 37-42
https://www.scirp.org/journal/wjcs
ISSN Online: 2164-3210
ISSN Print: 2164-3202

Hybrid Repair of Two Consecutive Acute Ventricular Septal Ruptures after Evolving Myocardial Infarction: Case Report

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How to cite this paper: Makhdoom, A.M. and Elassal, A.A. (2021) Paper Title. *World Journal of Cardiovascular Surgery*, **11**, 37-42.
https://doi.org/10.4236/wjcs.2021.114006

Received: March 24, 2021
Accepted: April 26, 2021
Published: April 29, 2021

Abstract

Background: Acute Ventricular septal rupture is one of dreadful complications of acute evolving myocardial infarction. Despite urgent management is lifesaving, it is still challenging and has a high risk of mortality particularly if recurrent or residual defects occurred. Evolving of skillfulness in transcatheter intervention of heart diseases paved the way for successful hybrid management of challenging cardiac cases specially for residual complicated cases post cardiac surgery. **Case Presentation:** We described here a successful hybrid two stage technique (surgical then transcatheter approach) to close two consecutive acute ventricular septal ruptures in 75 years old female presented with cardiogenic shock post evolving myocardial infarction. **Conclusion:** Hybrid repair by surgical and transcatheter interventions may be a good therapeutic modality for acute septal ruptures specially for residual or new defects after initial closure.

Keywords

Hybrid, Repair, Ventricular Septal Rupture

1. Introduction

Acute ventricular septal rupture (VSR) is a rare but lethal mechanical sequalae of acute myocardial infarction (AMI) [1]. Although the incidence of VSR has declined in the era of tremendous efforts of reperfusion, the mortality rate is still extremely high [2] [3]. Surgical management is the common definitive option for post-infarction VSR. Outcomes in 2876 VSR patients from the Society of Tho-

racic Surgeons National Database who managed surgically were reported by Arnaoutakis *et al.* [4]. They stated that operative mortality was 54.1% (1077/1990) if repair was ≤7 days from MI, and 18.4% (158/856) if >7 days from MI and they concluded that ventricular septal rupture remains a devastating complication after MI and the emerging alternative therapies such as percutaneous closure devices may be a good choice for high risk patients. Despite traditional surgical treatment, Percutaneous catheterization guided closure results in favorable short- and long-term outcomes for VSR patients [5]. We present here a hybrid of both surgical then transcatheter closure of VSR in 75 years old female with cardiogenic shock after acute evolving myocardial infarction.

2. Case Presentation

A 75 year's old female presented with extensive anterior myocardial infarction. On emergency room (ER) admission, she was haemodynamically unstable so vasoactive inotropic drugs were started and intraaortic balloon counter pulsation (IABP) was inserted. A systolic murmur was detected. Transthoracic echocardiography (TTE) revealed an antero-apical VSR (**Figure 1**).

Cardiac catheterization revealed ostial to proximal 90% occlusion of left anterior descending artery (LAD) and multiple skipped lesions of non-LAD coronary arteries. Cardiology-cardiac surgery teams decided emergent surgical repair of an antero-apical VSR with or without coronary artery bypass grafting according to intraoperative assessment. Patient pushed from Cath lab to operative room and the surgical team decided to close the VSR and to graft internal mammary artery (LIMA) to LAD. The main target of general anesthesia was to maintain systemic arterial pressure and to decrease afterload. Induction of general anesthesia was a combination of fentanyl, ketamine, and propofol, that successfully inhibited fluctuated hemodynamic parameters related to induction of anesthesia

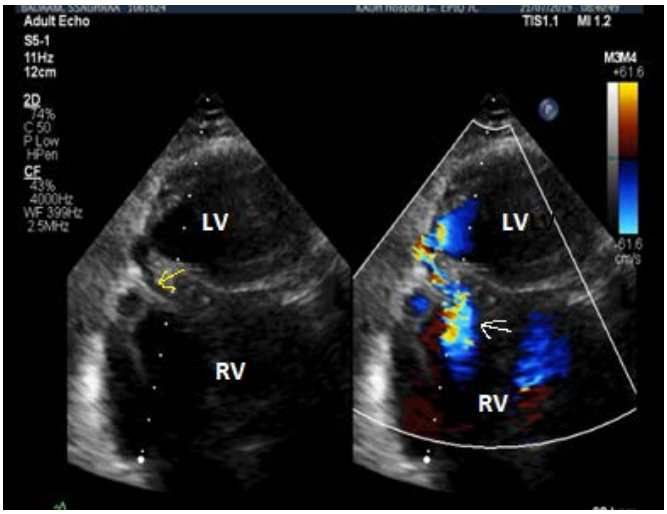

Figure 1. Preoperative transthoracic ECHO revealed antero-apical VSR diagnosed by left to right shunt (white arrow) in doppler mode and loss of septal integrity in M mode (yellow arrow). LV: left ventricle, RV: right ventricle.

and tracheal intubation. Intravenous milrinone was added with other vasoactive inotropic drugs to reduce systemic vascular resistance. Through left ventricular incision parallel to mid to apical interventricular groove, the VSR was closed by bovine pericardial patch and a second bovine pericardial patch was fashioned to exclude the apical part from the left ventricular (LV) cavity. Left ventricular incision was closed by two layers of prolen stiches buttressed by 2 strips of Teflon. The patient was weaned well from cardiopulmonary bypass (CPB) on moderate dose of vasoactive inotropic drugs and intraaortic balloon counter pulsation. Intraoperative transesophageal echocardiography (TEE) showed no residual VSR. On the third day in intensive care unit (ICU) the patient deteriorated and troponin I was gradually increasing with evidence of new ST segment changes in electrocardiography (ECG) which denoted new evolving MI. TTE showed another new mid-inferior VSR about 12 mm (Figure 2).

The haemodynamic instability in a high-risk post cardiac surgery patient, led us to close the new mid-inferior VSR by percutaneous intervention at the 3rd postoperative day. The procedure was performed under general anaesthesia. Access was obtained through the right femoral vein. Location, size of the VSD, and its relationship with the aortic valve were assessed. The VSD size was 12 mm located on the RV side at mid-inferior septal area. VSD amplatzer device size 14 mm was decide to be used based on TEE Echo and TTE just before the procedure. Through the VSD, a 0.35-inch Terumo guidewire (Terumo Corporation, Japan) was introduced from the RV to LV using JR 4 Catheter with 2 PTCA wires then by Terumo wire subsequently advancing from the femoral vein. The delivery catheter was introduced from the venous access to the RV, LV, and to the ascending aorta. The closure device was connected to the cable, advanced to the defect through the delivery catheter, and then deployed under fluoroscopic and ECHO guidance (Figure 3).

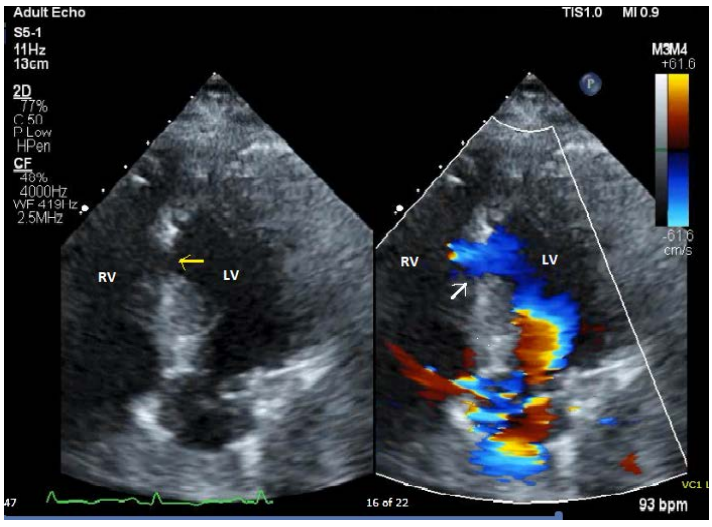

Figure 2. Postoperative transthoracic ECHO revealed new mid-inferior VSR diagnosed by left to right shunt (white arrow) in doppler mode and loss of septal integrity in M mode (yellow arrow). LV: left ventricle, RV: right ventricle.

Figure 3. Postoperative transcatheter closure of new mid-inferior VSR by amplatzer device size 14 mm mode (yellow arrow).

ECHO was performed before release to confirm proper device position. Left ventricle angiography showed only minimal shunting through the device. Improvement of hemodynamic state, allowing removal of intra-aortic balloon pump in less than 48 hours and reduction of dose of vasoactive inotropic drugs. She stayed 7 days on mechanical ventilation, 18 days in ICU till full weaning from vasoactive inotropic drugs and 28 days in hospital until she recovered. TTE on discharge revealed ejection fraction (EF%) of 25% and small residual 4.5 ventricular septal defect. In Outpatient clinic after 2 weeks from hospital discharge, she came with dyspnea on climbing third floor with no orthopnea or lower limb edema on mild doses of anti-failure drugs. Follow up TTE after 7 months revealed same findings of that of hospital discharge and patient presented with no dyspnea on the same doses of ant failure drugs. Informed consent obtained from the patient to report this case.

3. Discussion

Percutaneous closure of post-infarct VSR was first reported in 1980s. From that time, an improvement in device technology has been achieved [6]. The transcatheter approach to close post-infarct VSR is reserved to high-surgical-risk patients, in cardiogenic shock, failed surgery, or VSR with difficult site to allow surgical closure [7]. Assenza *et al.* performed 30 cases of device closure of acute VSR. He stated that it is effective and early closure VSR is advisable before establishment of multiorgan dysfunction [8]. Surgical closure of VSR is associated with residual shunts being as high as 37%, with up to 11% of patients requiring a second surgical procedure [6]. However, in state of haemodynamic compromising, second surgery will be of high risk of mortality and transcatheter approach seems to be a less invasive modality. Jorge *et al.* concluded that transcatheter closure of VSR as a bridge to surgery is a good option in cases with high surgical risk, allowing hemodynamic stability and thus a gain in time before another surgical intervention, improving these patients' outcome. They performed hybrid closure of VSR but started first with transcatheter approach and they managed residual shunt from Amplatzer device by surgical repair [9]. In our case, we per-

formed two stage technique of hybrid surgical closure of acute apical VSR then transcatheter occlusion of another consecutive acute mid VSR in hemodynamically compromised old female. Our current case differed from previously mentioned reports in two points, the first was that the differently located second consecutive acute VSR was a complication from postoperative evolving myocardial infarction and not a residual VSD from the surgically repaired one, the second point was that in our hybrid repair, the transcatheter closure followed the surgical repair in contrast to common reports.

4. Conclusion

Transcatheter closure of acute ventricular rupture after acute myocardial infarction is a reasonable therapeutic option specially in high-surgically risk patients. Moreover, it is a good reserve for postoperative new or residual VSR after primary surgical correction as a good hybrid option performed by well cooperated cardiology, cardiac surgery, anesthesia and intensive care teams.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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