Surgical Management of Acute Myocardial Infarction

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Abstract

Objectives to define the outcome of patients, undergoing surgery for complications of acute myocardial infarction (MI)***.*** ***Background*** Despite the advances in the management of MI, with marked drop of the incidence of complications, mortality due to mechanical complications remains high. ***Methods*** From December 2003 to June 2014, 23 patients underwent surgery for post MI mitral incompetence, ventricular septal defects (VSD) and free wall rupture (FWR). ***Results*** All patients had a concomitant CABG with venous grafts. Acute ischemic mitral regurge was found in 47.8%, ischemic VSD in 47.8% and FWR in 8.7% of cases. The 30- day operative mortality was 39.1%. The ischemic time was 70.65±17.45 min. The ICU stay was 6.17±2.29 days. Post operative duration of IABP was 3.5±1 days. ***Conclusion*** Patients with hemodynamic instability due to the mechanical complications of MI could be operated upon with an acceptable mortality.

Introduction

Despite the advances in the management of Myocardial Infarction (MI), including thrombolysis and primary percutaneous intervention[1], the incidence of related cardiogenic shock remained constant at 6-8% and represent 75-80 % of all patients with cardiogenic shock[2]. Related mechanical complications as severe MR(6.9%), ventricular septal defects (3.9%), and free wall rupture (1.4%) are the major surgically corrected causes[3].

Emergency surgical revascularization in cases with cardiogenic shock related to rupture myocardium is associated with high mortality (19-50%) and morbidity[4].

The purpose of this study is to review retrospectively the surgical results of cases that had a carcinogenic shock as mechanical complications of ST elevation acute myocardial infarction (STEMI).

Patients and Methods

Between January 2003 and June 2014, 23 consecutive patients underwent a surgical repair for VSD, MR, or Free wall rupture associated with coronary revascularization. Preoperative patient characteristics were collected including echocardiographic data. The time interval from the onset of infraction to surgery was recorded. Operative data, mortality and morbidity were analyzed. The time from the onset of infarction to admission to the operative room was noted.

Preoperative preparation

All patients were stabilized medically using inotropes , intraaortic ballon pump(IABP) and mechanical ventilation to achieve heamodynamic stability. Failure to adjust was an indication for an immediate surgery. During the time frame of the study, 27 patients died shortly after being diagnosed and before preparation for surgery.

Operative techniques

All patients had full median sternotomy, Bypass initiated using aorto-bicaval canulation. Cold blood home-brew cardioplegia was administered associated with topical cooling by ice slush. Systemic hypothermia to 28°c. In one case there was a posterior VSD associated to inferior pseudoanerysm . the pseudoaneurysm was opened and the original myocardial defect enlarged, then a double dacron patch technique was used to close the posterior VSD and the myocardial hole. In one case there was a crack in an apical infarction with leakage in the pericardium. There was a significant amount of clots . A Dor procedure was done along with CABG (SVG to LAD)

VSD Closure

In cases of anterior VSD, the septum was inspected via an anterior ventriculotomy in the area of the most scarred myocardium, and via right atriotomy. After careful debridement of all necrotic tissues, the VSD was closed using separate, interrupted, and pledgeted 4/0 polypropylene sutures. A fashioned Dacron patch was used at least 1 cm beyond the free margin of the VSD

(Fig1). Then the ventricultomy was closed supported by 2 dacron strips in a linear fashion in 2 layers. The first layer is interrupted and the second is continuous using 3/0 polypropylene sutures.

Mitral surgery

Three patients out of twelve patients with acute severe mitral regurgitation had the mitral valve replaced by an artificial mechanical valve (two of them size no 25 and the third size no 27). Those patients had a multiple rupture chordae and the mitral valve deemed irreparable.

Two patients had a repair of a single rupture chorda using polytetrafuroehylene suture and tight prosthetic complete ring. Seven patients had a repair by tight ring only. Ring Size 28 was used for males and 26 for females.

Statistical analysis

Statistical analysis Microsoft excel version 2010. Data are expressed as mean ±SD for continuous data and as a percentage for categorical data.

Results

Preoperative patient characteristics were shown in table (1). All patients had a concomitant coronary artery bypass grafting (CABG) using only saphenous vein grafts. The distribution of coronary revascularization were shown in Figure (1). The ischemic time was 70.65±17.45 min and the bypass time was 115.17±54.3 min. All patients were weaned of bypass with maximum doses of inotropes and IABP. In all cases adrenaline and noradrenaline was used initially. Millrinone was used in 6 cases done after 2009. The loading dose was 50μ/kg followed by a maintenance dose of 0.4/kg/min. Postoperative data was shown in table (2).

Mortality

The total mortality in the first month was 39.1 %(9/23). 4/23(17.4%) patients failed to wean off bypass and died. Two patients (8.7%) had uncontrollable bleeding and were closed over packs. Both died several hours later in the ICU. One patient died due to multiorgan failure at the fifth postoperative day. One

patient died in the 11th postoperative day due to severe respiratory infection secondary to prolonged intubation. One patient died in the 20th postoperative day out of septicemia and mediastinitis.

Table 1: Preoperative characteristics

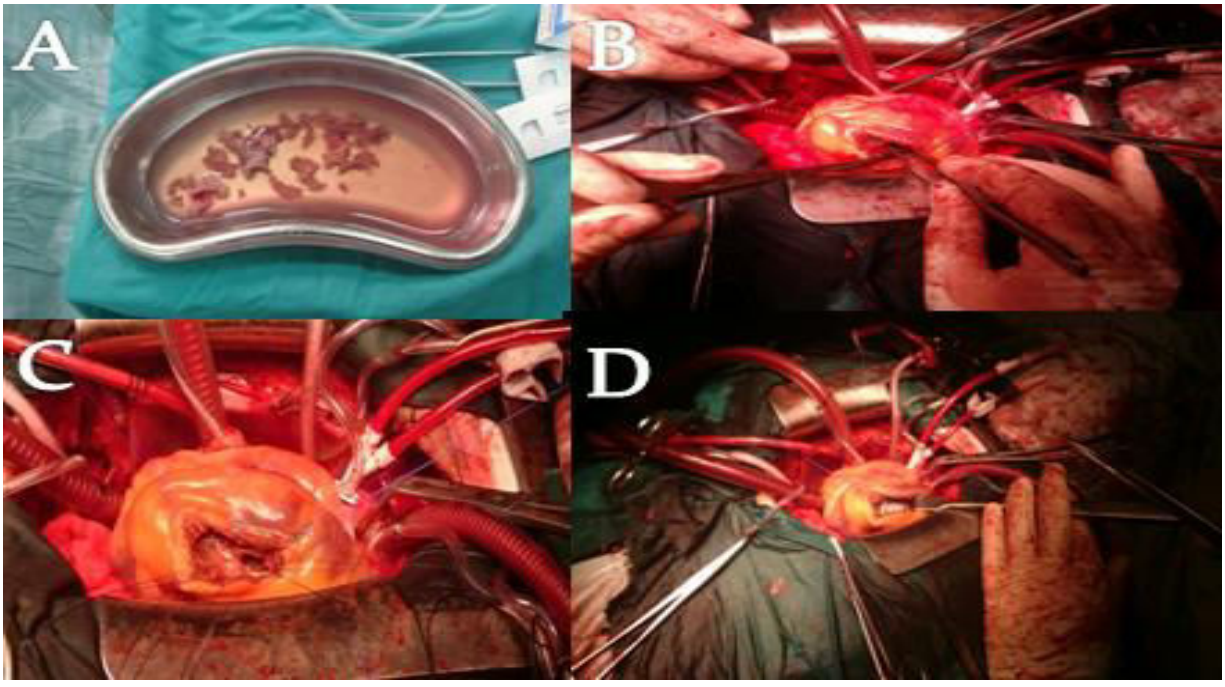
Charcartistics	Patients (n=23)
Male/Female	21/2
Age (years)	53.6±5.6
Hypertension	16/23(69.5%)
Diabetes	9/23(39.1%)
Chronic obstructive pulmonary disease	4/23(17.4%)
Acute mitral regurgitation (MR)	11/23(47.8%)
Anterior Ventricular septal defect(VSD)	9/23(39.1%)
Posterior VSD	2/23(8.7%)
Anterior VSD+MR	1/23(4.35%)
Posterior VSD+ Free wall rupture	1/23(4.35%)
Free wall rupture	1/23(4.35%)
VSD Diameter(cm)	1.6±0.53
EF%(ejection fraction)	39.6±4
Preoperative IABP	19/23(82.6%)
Preoperative intubation	11/23(47.8%)
Preoperative cardiogenic schock	18/23 (78.2%)
Time from MI to diagnosis(days)	7.17±4.86
Time from MI to Surgery(days)	Range (4-29), median (12)

Table(2): postoperative data

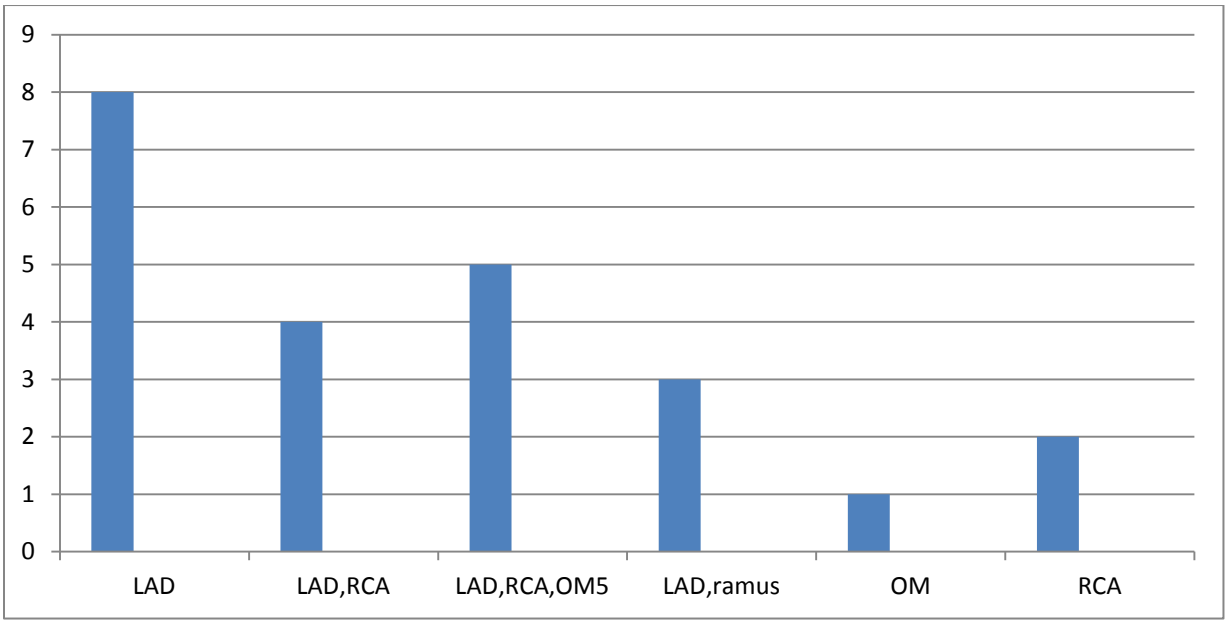
ICU stay (days) (n=17)	6.17±2.29
Mechanical Ventilation(days)	5.95±2.6
Duration of IABP(days) (n=17)	3.5±1
Duration of Inotropes(days) (n=17)	6.3±2.3
Initial dose of adrenaline(µ/kg/min)	0.146±0.065
Initial dose of noradrenaline(µ/kg/min)	0.134±0.64
Residual Shunts	3/11(27.2%)
Postoperative EF%* (n=14)	42.1±2.9
Hospital stay (days) (n=15)	20.5±9.5

* at 30 days postoperative echocardiography among survival

Fig(1): Closure of anterior VSD. A=necrotic tissues,B=vsd location,c= interrupted sutures, D= patch deployed



Fig(2): Distribution of coronary bypass grafts



LAD=left anterior descending artery, RCA=right coronary artery, OM=obtuse marginal.

Vertical axis represents the number of patients

Discussion

Mechanical complications attributed to STEMI have been associated with the worse outcome. Cardiogenic shock occurs in 10% to 27% of cases in the first 2 weeks[5]. Eighty five percent of patients with ischemic VSD die in the first 2 months[6]. Late repair of acquired VSD is technically easier due the maturity of tissues and scar formation, and the operative survival is about 70% of such patients[7]. However, persistence of shock despite of IABP and inotropes is associated with 100% mortality[8].

Labrousse et al recommended an early surgical repair[9], despite the higher risk due to friability of tissues and poor myocardial function[10].Coskun et al operated on 41 patients with ischemic VSD. The time interval from rupture to surgery was 23.1 days. Their mortality was 32%[11].

With acute ischemic mitral regurgitation, a fair ejection fraction often represents a severe left ventricular impairment. A higher prevalence of pulmonary oedema and mechanical ventilation dependence is secondary to the sudden regurgitant volume into the left atrium. Although surgery carries a risk of 40% in hospital mortality, yet it is considered as a surgical emergency[12].

Despite the success of percutaneous luminal angioplasty in reducing the amount of mitral regurgitation[13]. Yet , many cases did not benefit from revascularization alone and needs surgical correction[14].

(IABP) is now the most frequently used support for a failing heart in cardiac surgery to reduce mortality. The later ranges from 18.8% to 19.6% for preoperative insertion, from 27.6% to 32.3% for intraoperative insertion, and from 39% to 40.5% for postoperative insertion. By increasing the cardiac output without increase in oxygen demands, in a pulsatile manner, IABP may improve end organ perfusion and reduce the inflammatory response post bypass and myocardial infarction (MI). IABP augments coronary artery bypass grafts when IABP is instituted prior to CPB[15,16,17].

The strategy of preoperative insertion of IABP, and the sole use of venous grafts, and prompt diagnosis and management of such patients, lowered the mortality rate in such high risk group of patients. Tissue friability and end organ damage were the most common causes of mortality. Prolonged ICU and hospital stay with a longer duration of mechanical ventilation were an additive factor.

Patient with intense hemodynamic instability (5/23), who were operated early had the worse outcome regarding mortality (4/9). Patients who had a late surgery with controlled haemdynamics and improved cardiac functions had a better outcome.

Residual shunts detected by intraoperative trans esophageal echocardiography (TEE) that occurred in 27.2% of patients who had VSD closure were due to friability of tissues. Those patients had the worse haemodynamics, they operated earlier after their initial infraction and eventually they died intraoperatively due to failure to wean of bypass or shortly in the ICU. Most of the VSD,s done were

relatively small (1.6±0.5 cm). Bigger VSD were associated with larger infarctions and worse hemodynamic. Most of this patient died before being operated upon.

Conclusion

Patients with hemodynamic instability due to the mechanical complications of MI could be operated upon with an acceptable mortality. Proper stabilization of cardiac functions and waiting for infarction maturation led to a better outcome.

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