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Surgical Repair of Post Myocardial Infarction Ventricular Septal Rupture: Experience at a Tertiary Care Hospital

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KHAN ET AL.: *Surgical Repair of Post Myocardial Infarction Ventricular Septal Rupture: Experience at a Tertiary Care Hospital.* **Background:** Early surgery is indicated for ventricular septal rupture (VSR) that develops after myocardial infarction (MI). Surgical repair carries a high mortality. The purpose of this study was to find out the in hospital outcome of the surgical repair of this complication at a tertiary care high volume centre. **Methods and Results:** A retrospective descriptive study was done by checking the hospital record of all those patients who had undergone surgical repair of post myocardial infarction ventricular septal rupture from January 2008 to August 2014. The hospital ethical committee gave permission for the study. All the patients underwent identical surgical procedure for the repair of septal rupture. Perioperative variables were recorded and descriptive statistics obtained. A total of 40 such patients were identified including 24 (60%) male and 16 (40%) female patients with a mean age of 55.4 ± 10.7 years. Intra-aortic balloon pump was used in 27 (62.5%) patients preoperatively. Nine out of 40 patients were operated within 2 weeks of the occurrence of VSR. While 23 (57.5%) were operated after the 3 weeks of VSR. Six out of 9 patients died who were operated within 2 weeks. One out of 23 patients died who presented after 3 weeks duration after post MI VSR. **Conclusion:** Still a large number of patients suffer from post MI VSR in our setup. Surgical treatment carries high mortality especially those operated within first week. Patch repair of the ventricular septal is an acceptable treatment strategy for both anterior and posterior located septal ruptures. (*J HK Coll Cardiol 2015;23:1-5*)

Intraaortic Balloon pump, Outcomes, Post myocardial infarction ventricular septal rupture

摘要

背景：心肌梗死伴發室中隔破裂（VSR）是早期手術治療的適應症。手術修補破裂室中隔具有很高的死亡率。本研究旨在探索在大型三級醫療中心中手術修補破裂室中隔的院內結果。**方法與結果：**一項回顧性研究調查了2008年1月至2014年8月間所有心肌梗死後室中隔破裂並進行手術修補室中隔患者的病歷資料。本次調研已通過醫院倫理委員會同意。所有患者進行同樣的室中隔破裂修補術。記錄術前的變數，並做統計描述。總共納入40名合格患者，其中男性24（60%）名，女性16（40%）名，平均年齡為 55.4 ± 10.7 歲。27（62.5%）名患者使用術中主動脈內球囊泵。9名患者在VSR 2周內進行手術治療，23（57.5%）在VSR 3周後進行手術治療。前9名患者中有6名術後死亡，後23名患者中則有一名手術後死亡。**結論：**目前我們中心仍有大量的的心肌梗死伴發室中隔破裂患者。手術治療伴隨著極高的死亡率，尤其是室中隔破裂 1 周內進行手術治療的患者。補片修補位於前段和後段的室中隔破裂是一種可進行的治療方案。

關鍵詞：主動脈內球囊泵、結果、心肌梗死後室中隔破裂

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Introduction

Ventricular septal rupture is one of the mechanical complications of myocardial infarction. Acute myocardial infarction can lead to many mechanical complications like rupture of the free wall and pseudoaneurysm, rupture of the ventricular septum, acute mitral regurgitation, and tamponade.¹ Post myocardial infarction (MI) ventricular septal rupture (VSR) occurred in 1-3% patients in pre-thrombolytic era but with the advent of thrombolytic agents the incidence has reduced to 0.5-1%.² It carries a high surgical mortality and early intervention is warranted. Post MI VSR is either antero-apical or infero-posterior. Different surgical techniques are used for their repair. With advancement in perioperative management like the use of intra-aortic balloon pump and better surgical techniques, the operative mortality has decreased over the years.³ But in spite of such developments, it still carries a high operative mortality in patients who present early. Those surviving the first 30 days postoperatively have a good long term survival.⁴ This retrospective study describes the in hospital outcome of surgical treatment of post MI VSR in a high volume unit.

Materials and Methods

This retrospective observational study was conducted at the Department of Cardiac Surgery, Punjab Institute of Cardiology, Lahore, Pakistan. It is a high volume centre where annually 2100 cardiac operations are performed on the average. Hospital record of all those patients operated for ventricular septal rupture after myocardial infarction from January 2008 to August 2014 was studied and various preoperative, intraoperative and postoperative variables were recorded. The time interval from the onset of symptoms to surgery was recorded. A 30 day follow up was obtained from the hospital record for all patients including telephonic information about those patients who had left the hospital before 30 days period. The outcome and in hospital mortality of all the patients were collected.

Surgical Technique

Surgical technique was identical for all the patients. The VSR was approached from the left ventricle with incision in the infarcted myocardium. A patch reconstruction of the VSR with Dacron™ was performed in every patient. Pledgeted prolene sutures were used with pledgets on both the right ventricular and left ventricular side of the septum. The defect in the left ventricular wall was closed using Teflon™ felts and taking big enough bites in the myocardium to include the infarcted or aneurysmal myocardium. Concomitant coronary artery bypass grafting (CABG) was performed where needed. No additional procedure was needed in any patient.

Data Analysis

The SPSS (version 16, SPSS Inc.) was used for the data analysis. Quantitative variable were presented as mean±standard deviation and the qualitative variables were presented as frequency and percentages.

Results

A total of 40 patients were included in the study. Number of male patients was 24 (60%) and female patients were 16 (40%). Mean age was 55.4±10.7 years. The clinical and demographic characteristics of the patients are presented in Table 1. Intra-aortic balloon pump (IABP) was used in 27 (62.5%) patients preoperatively. The mean ejection fraction of all the patients was 42.33±10%. Nine out of 40 patients were operated within 2 weeks of the occurrence of VSR. Most of the patients (23 (57.5%)) were operated after the 3 weeks of VSR. Preoperative cardiac angiogram could not be obtained in 2 patients as they had to be operated quickly due to haemodynamic deterioration. Concomitant CABG was performed in 29 (72.5%) patients. Six out of 9 patients died who were operated within 2 weeks. Five of those 6 patients were operated in the first week after VSR diagnosis. Out of those five patients, 4 were in cardiogenic shock who received

IABP preoperatively. Three of these patients did not survive the procedure. Mortality was very low in those presenting late i.e., only one out of 23 patients died who presented after 3 weeks duration after post MI VSR (Table 2). Residual ventricular septal defect (VSD) was detected in 5 patients on postoperative echocardiogram. But none of these 5 patients died. Mortality was significantly low in patients in whom preoperative IABP was used. Three out of 4 patients with postero-inferior VSR died while mortality was significantly low in patients presenting with antero-apical VSR i.e. 5 out of 36.

Discussion

To the best of our knowledge, this is the largest report on the outcomes of surgical repair of post myocardial infarction ventricular septal rupture in Pakistan. Over a period of five years, 40 patients were operated for post myocardial infarction which is a large number of patients compared to the international literature. The reason for this high number may be the huge population that is covered by our hospital and secondly, a large number of patients still do not have access to instant thrombolytic therapy in this part of the world. Reports in 70s and early 80s, when thrombolytic therapy wasn't common, showed a high incidence of post MI VSR. The GUSTO-I trial then mentioned an incidence of 0.20% and the reason they gave for the decreasing incidence was more and more availability of thrombolytic therapy.²

This mechanical complication of myocardial infarction carries very high in-hospital mortality. Report by George and colleagues described the surgical results of post MI VSR from the Society of Thoracic Surgeons database.⁵ Mortality in their report is 42.9%. They have

mentioned time interval from MI to operation and then surgery. They showed that 54% of the patients operated within 7 days of MI had in-hospital mortality. Anders and colleagues similarly showed a mortality of 41%.⁶ But mortality rates as low as 19% have also been reported.⁷ Morality in our study was 20% which is evidently on the lower side compared to most of the international reports. This can be explained by the fact

Table 1. Clinical characteristics of the patients

Variable	Patients n=40
Age	55.4±10.7 years
Male/Female	24 (60%)/16 (40%)
Diabetes mellitus	13 (32.5%)
Hypertension	27 (65%)
History of smoking	10 (25%)
Preoperative IABP	27 (62.5%)
EF	42.33±10%
Cardiogenic shock	4 (10%)
Postero-inferior location of VSR	4 (10%)
Antero-apical location of VSR	36 (90%)
Concomitant CABG	29 (72.5%)
Mean CPB time	95.45±25.06 minutes
Mean cross clamp time	67.9±13.88 minutes
Length of stay in ICU	11±5 days
Residual VSD	5 (12.5%)
CVA	3 (7.5%)
Postoperative acute kidney injury	13 (32.5%)
Pleural effusion requiring tapping	6 (15%)
Postoperative RRT	4 (10%)

IABP: intra aortic balloon pump; EE: ejection fraction; VSR: ventricular septal rupture; CABG: coronary artery bypass grafting; CPB: cardiopulmonary bypass; ICU: intensive care unit; VSD: ventricular septal defect; CVA: cerebrovascular accident; RRT: renal replacement therapy

Table 2. Relationship of time duration from diagnosis to surgery with early outcome

Time duration from diagnosis to surgery	In-hospital outcome		Total No. of patients
	Survival	Mortality	
<2 weeks	3	6 (66.67%)	9 (22.5%)
2 weeks to 3 weeks	7	1 (12.5%)	8 (20%)
>3 weeks	22	1 (4.3%)	23 (57.5%)
Total	32	8 (20%)	40

the most of the patients presented late and 90% patients had antero-apical VSR. Both these factors have been proved to be predictors of survival in previous reports.⁵ Cardiogenic shock is an important risk factor for mortality in these patients.⁵ Only four of the patients in our study reached the hospital with cardiogenic shock. They were emergently operated and only one of those four patients survived showing the very high mortality rate in this subgroup of patients.

The time for intervention is very much decided by the haemodynamic status of the patient. Cardiogenic shock warrants immediate surgery. If the patient is haemodynamically stable, optimization with inotropes and mechanical cardiac support can be achieved and surgery performed after a delay of 3-4 weeks. If there is clinical deterioration, immediate surgery is indicated.⁸ Patients operated within one week of occurrence of VSR carry a very high mortality.⁹ On the other hand, patients operated after the 2 weeks period after VSR carried a very low mortality as evident from our study. The reason for high mortality in early operated patient may be the acute haemodynamically decompensated state of the patient and secondly the fresh, friable margins of the defect where necrotic process is still going on.¹⁰ We cannot wait for that length of time and deny early surgery to patients on ethical grounds as we don't know which patient will survive the initial high mortality period. So every patient should be given a chance and operated early when the diagnosis is made.¹¹

Intra-aortic balloon pump is an important addition to the management of post MI VSR. It was used in 62.5% of the patients in our study. The use of IABP in these patients significantly reduces mortality as shown by our report. IABP significantly reduces left to right shunt and afterload in these patients thus improving the haemodynamics.¹² The current guidelines for the management of post MI VSR recommends the routine preoperative use of IABP for every patient diagnosed with this problem.¹³

Whether to do concomitant CABG or not is a subject of debate. Coronary arteries have a varied pattern of disease in patients with post MI VSR. Cox and colleagues and Leavey and colleagues found single vessel disease to be more common in their patients.^{14,15} Triple vessel disease was found in 48.2% of the patients and concomitant CABG was performed in 72.5% of the

patients in our study. Barkera and colleagues in their article found triple vessel disease to be more common in patients with post MI VSR.¹⁶ The high number of patients with triple vessel disease in our study may be due to the extensive nature of coronary artery disease in this part of the world.¹⁷

Small residual VSD was observed in five patients postoperatively in our study. These patients did not suffer from any additional morbidity and they survived the immediate postoperative period. Yam and colleagues observed patients with residual VSD for 10 years and found excellent long term outcomes.¹⁸ We cannot infer at present from these findings as to what should be the fate of small residual defects that does not cause any shunt. Transcatheter closure of these defects has been described in literature.¹⁹

Our study is a retrospective report of the repair of post MI VSR at a single centre, thus carries all the drawbacks of a retrospective study. The sample size is also not statistically powered so as to find out all the predictors of mortality accurately. It doesn't describe the medium or long term follow up of the patients described thus we don't know the usefulness of the patch repair procedure in the long term. But this descriptive study gives an idea about the diseases burden and its surgical outcome in a developing country. We hope that with better facilities of thrombolytic therapy the incidence of ventricular septal rupture in the settings of acute MI will decrease. Advancements in the perioperative care and the availability of ventricular assist devices in this part of the world will certainly improve the surgical outcome of the patients especially those who present early to the hospital and those with cardiogenic shock.

Conflict of Interest Statement

None

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