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Research Article

Preliminary Results of the Surgical Treatment of Ischaemic Septal Wall Rupture

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2. Key words

Ventricular septal rupture; MI

1. Abstract

Background: Ischemic Septal Rupture is a lethal condition which mandates aggressive medical and surgical optimization. We reviewed 14 cases of ischemic septal rupture in our centers in the last 7 years.

Methods: We retrospectively collected the data of 14 of ischemic VSD who had surgical repair in 2 centers in Saudi Arabia in the last 7 years.

Results: Our study included 14 cases including 9 males. There were 6 patients in cardiogenic shock and needed preoperative IABP. The median timing between chest pain and VSD repair was 5 days. VSD were anterior in 8, apical in 4 and inferior in 2 cases. Six cases died in 30 days after surgery. Statistical analysis showed cardiogenic shock preoperatively and preoperative organ failures as the predictors of early mortality.

Conclusion: Aggressive optimization of cardiogenic shock prior to repair of ischemic VSD may improve the outcome.

3. Introduction

Ischemic Ventricular septal defect (VSD) is considered a true cardiac surgical challenge regarding the repair timing, technique and outcome. Repair of the VSD in the acute phase after infarction is still a matter of debate[1, 2].

The guidelines in 2004 advocated immediate surgical repair of the VSD irrespective of the patient's haemodynamic status to overcome further hemodynamic deterioration[3].

Best evidence topic concluded that timing of repair is a decision based on hemodynamici.e. if the patient is in carcinogenic shock due to a large shunt and not a big infarct size, immediate surgery should follow resuscitation. If the patient is stable, surgery can be delayed for 4 weeks of medical optimization with inotropic and mechanical cardiac support. If there is clinical deterioration, immediate surgery is indicated[4].

The overall hospital mortality in some series was found to be 23.5%. The mortality was higher in patients who had surgical repair earlier than 1 week post infarction. The predictors of mortality were found to be earlier repair and inferior Myocardial infarction (MI)[5].

Mortality rate of 100% if repaired in 3 days after MI and 0% if repaired more than 3 weeks after MI was reported. It was found that shorter time between MI and surgery, cardiogenic shock, posterior VSD, Left Ventricular (LV) dysfunction and thrombolysis are the mortality predictors[6].

AS per some authors, surgery should be performed soon after the diagnosis in most patients. Hemodynamically compromised patients should be optimized medically with or without IABP[1]

Cooley was the first to repair ischemic VSD in 1957. Buttressed mattress suturing without patching the VSD was described by Daggett and associates. Single and or double patching were de-scribed later till David and associates described the infarct exclusion technique[2, 7-11].

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Our aim was to review our limited constrained experience in the repair of ischemic VSDs and endeavor to analyse our results and so we may be able to improve them.

4. Patients and Methods

This is a retrospective study which included 14 cases of ischemic VSD post MI operated upon in 2 centers in Saudi Arabia. They were diagnosed by history of chest pain, high cardiac enzymes including creatine kinase(CK) and CK-MB. Electrocardiographic(ECG) changes in the form of ST segment elevation or depression with or without Q waves. Echo and or cardiac cath. Showed ventricular septal defect with significant left to right shunt. Patients were diagnosed and treated by our cardiologists and they consulted us for surgery. The mean age was 54 years ranging between 47 and 84 years. Five days after first presentation with chest pain was the median time interval. Cardiac cath. showed multi-vessel disease in all patients. Cardio-genic shock was evident in 6 cases for whom aggressive medi-cal optimization and intra-aortic balloon pump (IABP) were required. Emergency VSD repair and coronary artery bypass grafting (CABG**)** were performed in 8 cases. All cases required median sternotomy, cardiopulmonary bypass and cardioplegia arrest. The cardiopulmonary bypass time was 140 minutes and ischemic time was 96 minutes. Single patch was used in **10** cas-es and double patch was required in 4cases. The median grafts number (no.) was 3. Ventilation time was 6 days. Intensive Care Unit (ICU)stay was 17 days. LV aneurysmectomy was performed in 2 patients and MV repair in one patient. Cardiopulmonary bypass with moderate hypothermic ischemic myocardial protection were used. The papillary muscles are assessed with the mitral valve. Closure of the septal defect and the infarctectomy area without tension which necessitates the use of a patch is the key. Patch on the epicardial surface with buttressing of the suture lines with pledgets or strips of Teflon felt or similar material to prevent sutures from cutting through friable muscle are required. ICU care is routine for our cardiac surgery cases. The patients are followed up by our team and with the cardiology. Statistical analysis was performed using the Chi square test for the categorical variables. T test was used for the continuous variables, mean, median and standard deviation. P value was considered significant when less than 0.05.

5. Results

This is a retrospective study including 14 cases of ischemic rupture repaired. The median age was 54 years with a range between 47 and 84 years. Females were more than females. The mean time between first chest pain presentation and surgery in our series was 5 days. It was 10 days in survivors and 3 days in non survivors Urgent surgery was performed in 6 cases within few hours of presentation in our centre. Eleven cases were hypertensive. Thirteen had DM and all cases were in heart failure. Six cases were in cardiogenic shock. Renal insufficiency was evident in 4 cases. We used IABP to optimize 6 of our patients. Urgent surgery was needed in 6 cases. Nine cases had 3 vessel coronary disease. The mean ejection fraction was 48 and 50 minutes in both groups of those who survived and deceased cases (**Table 1**).

Anterior VSD was the commonest in more than half of our series followed by apical and then by inferior VSD. We used cardiopulmonary bypass with aortic clamping and cardioplegia in all our cases. Our mean bypass time was 132.5 and 150 minutes in the survivors and non survivors. The mean ischemic times were 89 and 105 minutes. Six patients had anterior VSD. Mitral valve repair was required in one patient. Single patch was performed in 10 cases (**Table 2**). Six Cases died due to multiorgan failure.

Table 1: Preoperative Data

	Survivors	NON Survivors
Age in years	56(47-80)	52(51-84)
Male Gender (number of cases)	4(28.56%)	2(14.28%)
HTN (number of cases)	6(42.8%)	5(35.7)
DM (number of cases)	8(57.12)	5(35.7)
HF(number of cases)	8(57.12)	6(42.8%)
Renal insufficiency(number of cases)	2(14.28%)	2(14.28%)
Cardiogenic shock (number of cases)	3(21.42%)	3(21.42%)
IABP (number of cases)	3(21.42%)	3(21.42%)
Mean Euroscore Standard Deviation	26 (28.5 ± 8.2)	40 (41.5±7.2) P 0.02
Urgent surgery(number of cases)	3(21.42%)	3(21.42%)
Timing between MI and surgery in days	10(0.3-21)	3(0.5-7) p 0.034
Single vessel disease(No. of cases)	1(7.14%)	1(7.14%)
Two vessel (No. of cases)	2(14.28%)	2(14.28%)
Three vessel disease(No. of cases)	5(35.7)	4(28.56%)
Mean Ejection Fraction %(EF) Standard Deviation EF	48 (48.5 ± 11.3)	50 (47.5 ± 12.9)

Table 2: Intraoperative data

	Survivors	NON Survivors
Anterior (number and percentage of cases)	5(35.7%)	3(21.42%)
Apical(number and percentage of cases)	2(14.28%)	2(14.28%)
Inferior((number and percentage of cases)	1(7.14%)	1(7.14%)
MV repair(number of cases)	0	1(7.14%)
Mean Bypass time in Minutes Standard deviation	132 (127.0 ± 19.3)	150 (144.0 ± 16.3) p 0.04
Mean Ischemic time in Minutes Standard deviation	89 ((84.0 ± 11.1)	105 (106.0±13.5) p 0.036
Single patch(Number)	6(42.8%)	4(28.56%)
Double patch(Number)	2(14.28%)	2(14.28%)

6. Discussion

Our retrospective study included a relatively small number of cases(14 cases) over a duration of 7 years. Takahasi and associates reviewed a larger no.; 52 cases over a period of 30 years[2]. Menon V and associates included 55 patients with ventricular septal rupture and cardiogenic shock [8]. Anyway, this is a starting initial experience with gaining a learning curvefor such a lethal problem.

In our cohort, the median age was 54 years with a range between 47 and 84 years. In the series of Abu Omar and associates, the median age was 69 years[12].

In our series, females were about 58% of the cases while Abu omar and associates found dominance of males in about 69%[12].

The mean time interim between first chest pain presentation and surgery in our series was 5 days. It was 10 days in survivors and 3 days in non survivors. Takahasi and associates found the mean time between myocardial infarction and surgical intervention to be significantly longer in patients who survived for 30 days than in those who did not[2].

All our cases had preoperative heart catheterization. They were referred from our cardiologists and the nearby hospitals. As per David TE, coronary angiography should be performed be-fore surgery because approximately two-thirds of the patients have multivessel disease, and concomitant revascularization is important to improve surgical outcome[1].

There has been controversy in the literature concerning the advantages and disadvantages of concurrent coronary artery grafting in patients undergoing emergent repair of ischemic VSD post MI. The guidelines of the American College of Cardiology/American Heart Association in 2004 recommend immediate surgical intervention to prevent further hemodynamic deterioration in patient with VSR[13].

There is still an ongoing debate whether the conservative treatment can work in such cases. Marek S and associates and Cook and Gleason do not advise conservative treatment[14,15]. Menon and associates operated upon only 56% of their series of VSR[8].

IABP was used in 6 cases to optimize them. chronic renal replacement therapy, aggressive diuresis, dobutamine and IABP were required in both groups Those with delayed surgery with a longer timing between first presentation and surgery had a longer time and better optimization and hence they had a better result. ECMO or assist devices were not used during this study. Crestanello JA. believes in the role of venoarterial extracorporeal membrane oxygenation and other temporary circulatory support and may result in improved survival [16].

Our team used LV approach in this series. However, LV, RV and even transatrial repairs are described[17-20].

Tokuda T. and associates and Furukawa K and associates described a transatrial approach to repair the septal rupture[16-20]. Cardiopulmonary bypass with aortic clamping and cardioplegia. The mean bypass time was 132.5 and 150 minutes in the survivors and non survivors. Ischemic times were 89 and 105 minutes respectively. Imaqawa and associates reported aortic cross-lamp time of 128 minutes (82 to143 minutes)[21].Apostolakis EE and associates., described a non ischemic repair[22].

CABG was performed for all cases in this series. Menon and associates reported concomitant CABG in 68% of their series and Abu Omar reported 75% of concomitant coronary artery bypass grafting[8-12].

The Euroscore in was 26 and 40 in survivors and non survivors. Takahashi and associates reported a Euroscore of 41 ± 24%[2] there was a significant difference between survivors and non survivors regarding the Euroscore in this series. We had more than 40% mortality in our series. Six over 14 cases died in 30 days due to multirogan failures. The significant predictors of death were earlier surgery with a significantly shorter time between presentation and surgery and higher Euroscore. Takahashi and associates reported a mortality rate of 36%, Asai T reported a mortality rate of 19%. Menon had a mortality rate of 81% while Abu Omar et.al. Reported mortality rate of 39%. The predictors of death were similar to those published by Takahashi and associates., Asai T, and Abu Omar and associates who found them to be renal impairment, cardiogenic shock. Emergency situation, high EuroSCORE, multi-vessel coronary disease with incomplete revascularization and long cardiopulmonary bypass time were also significant mortality predictors[2,11-12].

Non surgical candidates or with tolerable defects or with post repair patch leake may benefit from trans catheter closure[23].

7. Limitations

This is a retrospective study with the inherent defects of retrospective studies. It also includes a small number of cases operated upon in 2 different centers with 2 different setups.

8. Conclusions

Aggressive optimization of cardiogenic shock prior to repair of ischemic VSD using IABP, diuretics, milrinone, dobutamine with improving different organ functions before ischemic VSD repair may improve the outcome.

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