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Original Article

Cabg outcomes in patients with postinfarctional ventricular septal rupture

Ramil Arif Aliyev

Central Hospital of Oil Workers, Baku, Azerbaijan

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Corresponding Author: Ramil Aliyev, Central Hospital of Oil Workers, Baku, Azerbaijan
Email: shaman_ra@mail.ru

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Abstract

Aim: Postinfarctional ventricular septal rupture (Post MI VSR) is the most fatal complication of the myocardial infarction. The mortality rate in modern and in-time surgical management is varying between 10 and 40%; the survival rate is 88% in the first year. The issue of CABG (coronary artery by-pass grafting) is still the subject of great discussion. In order to clarify this issue, we decided to analyze the short- and long-term outcomes of CABG in our patients with Post MI VSR.

Material and Methods: In our research we analyzed 90 patients with IHD (ischemic heart disease), complicated with Post-MI IVS rupture (Post -MI IVSR). Most of the patients with Post MI VSR were over 60 years old. The Post MI VSR within first days after acute myocardial infarction (AMI) was detected in 10 patients; up to 3 days – in 6 patients; up to 7 days – in 3 patients; from 7 to 29 days – in 4 patients. The time of IVS rupture after AMI was varying from 1 to 29 days (5.5±7.6 дней). All patients were distributed into groups depending on the hospitalization time after AMI.

Out of 83 patients underwent reconstruction after Post MI VSR, 79 (95.2%) required CABG. Two- or three-vessel lesions were detected in 67 (80.7%) patients. Cumulative mortality in CABG group was 19.7%, whereas in the group without accompanied CABG – 20%. The long-term outcomes were followed from 1- to 8 years, averagely in 18 patients (28.6%).

Results: The decompensation of heart failure and relapse of coronary symptoms during follow-up up to 3 years was observed in 6 (33.3%) patients, during follow-up from 3 to 8 years – in 3 (25%) out of 12 patients. The repeated revascularization was conducted in 5 patients.

Conclusion: Our results are showing the benefits of CABG in patients with Post MI VSR, which requires mandatory coronary angiography in pre-op period.

Keywords: Post- infarction rupture of the ventricular septum rupture, acute myocardial infarction, atherosclerosis of coronary arteries, ischemic heart disease, left ventricular aneurysm, aortocoronary bypass

INTRODUCTION

Clinical significance

Postinfarctional rupture of the interventricular septum (Post MI VSR) is quite rate but fatal complication of acute myocardial infarction. Without medical management the mortality rate is 24% in first days, 30-days mortality is 80% (1). The surgical management is optional strategy. The mortality rate in modern and timely management is varying between 10 and 40%; 5 -year survival is 88% (2). Bearing in mind the certain success in surgical management of rupture itself, the issue of coronary by-pass grafting is still the subject of discussion (3).

Some authors show that survival in long-term follow-up of the patients with Post MI VSR is not only depending on the coronary revascularization and the coronary angiography is time-wasting procedure and potentially risk-carrying and therefore could

complicate severe case. For example, Elbadawi is showing data that contractility of non-infarction zone is significantly improves after septal defect closure and aneurysm reconstruction without accompanying coronary by-pass grafting. As argument was presented significant decrease in ventricular wall strain and O2-demand (4). Other authors are showing data that accompanying coronary by-pass grafting prolongs operation time and examination of this patients on pre-op stage is potentially risk-carrying procedure (5). At the same time most surgeons are conducting regular coronary angiography in pre-op stage with following coronary by-pass grafting (6).

To clarify the abovementioned issue, we decided to analyze the available data on short- and long-term outcomes of CABG in our patients with Post MI VSR.

MATERIAL AND METHODS

In our work we analyzed the 90 patients with IHD, complicated with post-infarctional interventricular septum rupture (Post MI VSR), who underwent surgery in 2002-2019. 12 patients with Post MI VSR were operated in Central Clinic Hospital (CCH), Baku city, 78 patients – in National Institute of Cardiovascular Surgery named after N.M. Amosov (NICVS), Ukraine. The mean age of patients with Post MI VSR was 59.99±9.59 (min-max 29-81 years). Among patients' men were prevailing (72.2% men and 27.7% – women). The most operated patients with Post MI VSR were over 60 years old. 16 operated patients with Post MI VSR (17.8%) were over 70 years (11 men and 5 – women) (Table 1).

Table 1. Distribution of patients with IHD. complicated with Post MI VSR. based on gender and age. n / %

Age. years	Total number of patients	Men		Women	
		n	%	n	%
18-29	1	1	1.1	0	0
30-44	4	4	4.4	0	0
45-59	35	28	31.1	7	7.7
60-74	45	30	33.4	15	16.7
75-89	5	2	2.2	3	3.3
90 and over	0	0	0	0	0
Total	90	65	72.2	25	27.7

Note: n – number of patients

Post-infarctional rupture of IVS (interventricular septum) within first after acute myocardial infarction (AMI) was detected in 10 patients; up to 3 days – in 6 patients; up to 7 days – in 3 patients; between 7-29 days –4 patients. Rupture time after AMI was occurred from 1 to 29 days (5.5±7.6 days) (n=23).

The patients with Post MI VSR admitted to the cardiovascular surgery clinics in different time frame concerning onset of AMI. The patients with Post MI VSR were mostly hospitalized within 1 to 462 days (mean 57.2±68.99 days).

All patients with Post MI VSR were distributed on groups depending on the admittance date after AMI.

The first group (group I) consisted of patients with Post MI VSR hospitalized for surgery within 1 to 28 days after AMI (n=37; 12.48±8.39 days). Second group (group 2) – patients with Post MI VSR hospitalized for surgery within 29 to 56 days after AMI (n=21; 38.48±7.11 days). Third group (group 3) – patients with Post MI VSR hospitalized for surgery within 57 and more days after AMI (n=32;121.2±81.88 days).

In order to systematically analyze the patient groups, we clarified separate risk factors of IHD, which enabled us correct comparison of the different parameters (Table 2).

Table 2. The incidence ratio of IHD risk factors in patients with Post MI VSR depending on the different hospitalization after AMI, n /%

Group	Group 1(n=37)	Group 2(n=21)	Group 3(n=32)
Risk factors			
Smoking	9/24.3	3/14.3	3/9.4
Positive FH (family history)	1/2.7	2/9.5	1/3.1
Body mass index, kg/м² (>24.9)	24/64.8	13/61.9	20/62.5
Cholesterol, mmol/l (>4.5)	24/64.8	10/47.6	13/40.6
Glucose, mmol/l (>6.1)	9/24.3	4/19.0	4/12.5
Triglycerides, mmol/l (>1.2)	23/62.2	8/38.1	12/37.5
Arterial hypertension	30/81.1	16/76.2	24/75

The incidence ratio and number of AMI in patients with Post MI VSR was analyzed as well (Table 3).

Table 3. Distribution of the patients with Post MI VSR depending on the number of AMI, n /%

Group Number of AMI in PMH	Group 1(n=37)	Group 2(n=21)	Group 3(n=32)
1	34/91.9	20/95.2	31/96.9
2	3/8.1	1/4.8	1/3.1

Note: AMI – acute myocardial infarction, PMH – post-medical history

AMI in PMH (post-medical history) was verified in 91.9% patients of group I. We have noticed the high incidence of more than one MI in the patients of group I (8.1%).

In modern era, the "gold standard" of IHD diagnostics is selective CA (coronary angiography), which provides comprehensive diagnostic information on coronary anatomy, including cardiac hemodynamics, LV contractility and Post MI VSR (7).

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In all patients with IHD there was at least one main coronary vessel occlusion. Incidence and severity of atherosclerotic lesions in patients with Post MI VSR was depending on the different admittance time after onset of AMI (Table 4).

Table 4. CA occlusion characteristics in patients with Post MI VSR depending on the different admittance time after onset of AMI

Group CA	Group 1 (n=37)	Group 2(n=21)	Group 3(n=32)	P
1 vessel	8/21.6	4/19.1	6/18.7	0.576
2 vessel	11/29.7	7/33.3	14/43.8	0.483
3 vessel	18/48.7	10/47.6	12/37.5	0.168

It is well known that LAD carries the main burden of atherosclerotic process among all CV (coronary vessels) (8). Bearing in mind no difference on mean age among groups (mean age f group I, respectively 60.0±9.6 years, group 2-60.0±9.5 years, group 3-60.1±9.5 years) ($p<0.05$), we analyzed atherosclerotic lesions and incidence rate of hemodynamically significant stenosis of main CVs in our patients (more 50%). The most important management technic for AMI is PCI (PTCA + stenting), therefore we analyzed reperfusion strategies used in revascularization in our patients with Post MI VSR (Table 5).

The high incidence of RCA occlusion in group I is of outmost concern - 16.2% (Table. 6).

Occlusion of two- and three vessels was detected in 67 (80.7%) patients.

Statistical analysis

The statistical analysis was conducted on Microsoft Excel 2010 data base. The statistical calculations were conducted by SPSS 16.0 for Windows program. The group of obtained data, which qualitatively characterized the indicators, was analyzed using Pearson's goodness-of-fit test or $\chi 2$ test. A confidence interval of 95% was adopted, $p<0.05$, the difference in signs was considered statistically significant.

Table 5. Distribution of patients with Post MI VSR depending on the reperfusion strategy of AMI in PMH, n /%

Group Myocardial reperfusion strategy	Group 1 (n=37)	Group 2 (n=21)	Group 3 (n=32)
PCI	8/21.6	1/4.8	2/6.2
Thrombolysis	1/2.7	2/9.5	0/0

Note: PCI – percutaneous coronary interventions

Table 6. Characteristics of coronary vessels lesions required PCI in PMH (post-medical history) in patients with Post MI VSR

Group Localization	Group 1 (n=37)	Group 2 (n=21)	Group 3 (n=32)
LAD	2/5.4	0/0	1/3.1
LAD and RCA	1/2.7	0/0	1/3.1
RCA	5/13.5	1/4.7	0/0

RESULTS

Among 83 patients with Post MI VSR reconstruction 79 (95.2%) patients required CABG (Table 7).

The patients with single-vessel and multi-vessel occlusions had similar parameters as mean age, gender and pre-op status. The only difference is use of IABP (intraaortic balloon pump) and longer inotrope support required in the group I, possibly caused by admittance to the clinic in cardiogenic shock status.

The patients with single-vessel occlusion required "patch" of less size which could be considered as less extensive defect, but more detailed analysis showed that most of the defects were antero-septal, although the multi-vessel occlusions characterized by infero-posterior defects in IVS segment. Cumulative mortality in group with CABG was 19.7%, whereas in group without CABG -20%.

Table 7. Surgical revascularization of the LV (CABG, coronary circulation recovery) in patients with different localization of Post MI VSR, n / %

Parameters	Localization of Post MI VSR	Anterior (n=45)	Posterior (n=34)	$\chi 2$	p
Mean anastomosis number in one patient		2.1±1.0	2.0±0.98	$\chi 2=1.108$	0.583
Anastomosis	LIMA anastomosis	5/10.6	1/2.8	$\chi 2=6.694$	0.039
	Sequential anastomosis VSM	11/23.4	6/16.7	$\chi 2=0.348$	0.531

Note: CABG – coronary by-pass grafting; VSM – Vena saphena magna; LIMA – Left internal mammary artery

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Table 8. Post-op parameters in patients with post-MI IVSR in different hospitalization period after onset of AMI, M ± SD

Group / Parameters	Group 1 (n=32)	Group 2 (n=20)	Group 3 (n=31)	p
Ventilator duration, hours	26.2±41.8n=25	42.9±137.4n=9	43.2±133.7n=21	0.953
Nitrate infusion, hours	48.6±71.2n=12	21.2±43.3n=4	41.2±67.8n=9	0.724
Inotropic support, n/%	23/72.0	9/45.0	20/64.5	<0.05
Noradrenalin, infusion hours	28.±61.4n=8	24.9±58.8n=4	24.5±57.0n=7	0.641
Dopamine, infusion hours	32.6±57.4n=13	23.5±40.3n=5	44.9±132.1n=10	0.527
Adrenalin, infusion hours	20.3±48.0n=5	20.3±48.0n=5	17.5±44.5n=6	0.861
Dobutamin, infusion hours	38.1±53.6n=18	38.9±36.7n=2	40.0±54.4n=14	0.356
Drainage, ml	590.7±927.0n=21	455.3±789.5n=9	562.8±921.6n=15	0.229

Note: ventiltator – artificial lung ventilation

The long-term outcomes were analyzed in mean follow-up period 1-8 years, averagely in 18 (28.6%) patients. During 1-, 3- and 8 years follow-up 17, 12 and 2 patients were analyzed correspondently. The better results were detected in 5- and 10 years follow-up in 87.5% and 64.3% correspondently (figure 1). Based on reference, the repeated complaints in this group was due to heart failure decompensation after ventriculotomy and remodeling of the left ventricle.

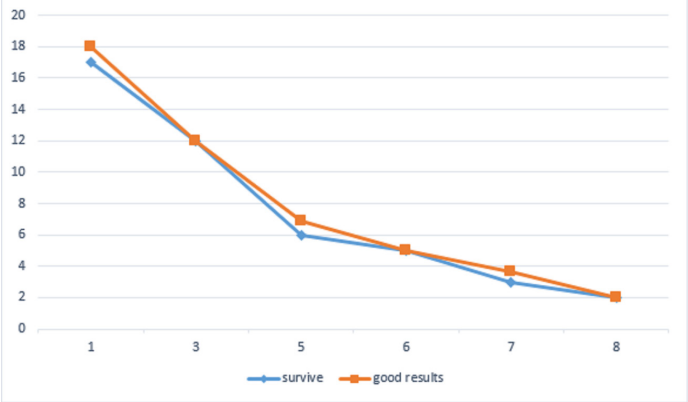

Figure 1. Caplan Meier analysis curve, showing survival and maintenance of good results

Relapse of heart failure and coronary symptoms up to 3 years was observed in 6 (33.3%) patients, in 3-8 years – in 3 (25%) out of 12 patients. Repeated revascularization was performed in 5 patients.

DISCUSSION

These data are coincident with data from other authors, researching angiographic parameters. CABG was performed in 79 out of 83 patients and correspondents to literature references. Based in reference data, there is no significant difference in survival between groups with CABG and without it (3,7,9). But during detailed analysis it was found out that there was no analysis of mid-term and long-term outcomes after operations and so, it is not clear what is the future perspective of circulation in the vessels not causing present infarction.

During analysis of patients if the single-vessel occlusions are excluded, we found out significant difference in in-hospital outcomes of the patients with CA multivessel occlusions with and without CABG.

In patients with post-MI IVSR occlusion in CA is underlying cause of the current disease. For example, in patients with LV aneurysm additional CABG had certain positive impact on long-term results (10). In our research the CABG had direct positive impact on long-term survival as well (11). There are many scientific data on impaired coronary circulation in patients with post-MI IVSR (12). Moreover, there is certain separating effect ("zone") of infarction-dependent area from other heart regions and during angiographic assessment worse long-term outcomes were detected in patients without CABG.

Anterior wall defect was detected in patients with single-vessel occlusion more often than in multivessel occlusion group. Unfortunately, patients with anterior wall defect were not assessed by coronary angiography in some author series, which makes analysis of these data incomplete and non-comprehensive.

In our research all patients underwent coronary angiography irrespectively of damage zone and we detected significant improvement of the long-term outcomes in patients with accompanied coronary by-pass surgery, particularly in recent years.

This could be possibly due to better myocardial protection, delayed intervention, better peri-operational management and

improved « Learning curve» of our team (11).

Our results assume potential benefit of CABG in patients with post-MI IVSR, which requires obligatory coronary angiography in pre-operational diagnostic continuum.

CONCLUSION

Conflict of Interests: The author declares that there are no conflict of interests.

Financial Disclosure: There are no financial supports.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics committee approval: The study complied with the Declaration of Helsinki, was approved by the Central Hospital of Oil Workers and was conducted according to the protocol and using minimal invasive surgical techniques.

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