

Early postoperative complications in patients with acute myocardial infarction during emergency coronary bypassing

BORYS TODUROV¹, ALEXANDER BITSADZE¹
¹SE “Heart Institute of MOH of Ukraine”, Kyiv, UKRAINE

Abstract: Despite the success results of interventional cardiology, the indications for coronary artery bypass grafting in acute myocardial infarction, according to the recommendations, are quite limited. In recent years, the optimization of perioperative management of patients, including myocardial protection, has helped to improve the effects of treatment by emergency surgical revascularization in patients with cardiogenic shock. Thus, it is important to learn the results of emergency surgical myocardial revascularization in patients with acute myocardial infarction (AMI), which were previously considered incurable or in cases where interventional cardiology is ineffective. Therefore, the aim of the study was to conduct a prospective analysis of the immediate clinical results of the early postoperative period to determine the factors of early mortality in emergency coronary artery bypass grafting. **Research methods.** The research is based on the prospective investigation of 129 patients who were hospitalized in Kyiv “Heart Center” through the period from 2011 to 2015. At 100,0% the ST-elevated myocardial infarction (STEMI) of them it was verified, at 29,0 patients non- ST-elevated myocardial infarction (NSTEMI) was set. In early postoperative period, we have analyzed such events like inotropic support duration, necessity of intra-aortic balloon pump, the episodes of the development kidney injury and respiratory failure, complete atrioventricular blockade, supraventricular tachyarrhythmia episodes, encephalopathy, rethoracotomy needs. Also early postoperative mortality endpoints were evaluated. **Research results.** It has been proven that in the presence of STEMI type of acute myocardial injury compared with NSTEMI type, there is a higher risk of acute left ventricular failure ($p < 0.05$) followed by intra-aortic balloon pulsation (IABP)- procedure ($p < 0,05$) and inotropic support ($p < 0,05$) in the early postoperative period. In patients of the STEMI group, acute kidney injury was recorded more often with reliable indexes of absolute and relative risks ($p < 0,05$). All cases of transient atrioventricular block after emergency coronary artery bypass grafting (CABG) were registered in patients with STEMI injury with significant changes of odds ratio ($p < 0.05$). It was established that the main structure of respiratory complications was due to prolonged mechanical ventilation, but the difference in the relative risk and odds ratio between the STEMI and NSTEMI groups is insignificant ($p > 0.05$), however the likelihood of supraventricular arrhythmia and encephalopathy in the NSTEMI group was reliably higher ($p < 0.05$). Estimates of the level of early postoperative mortality (12.4%) proved the probable relative risk ($p < 0.05$) and the odds ratio ($p < 0.05$) of mortality in the STEMI group, which was confirmed by the analysis of cumulative survival by Kaplan-Meier method (Criterion log-rank 2,74; $p = 0,006$). Mortality in the STEMI group was associated with previously diagnosed acute heart failure (56,2%), the onset of cardiogenic shock (31,3%) and the development of acute mitral regurgitation (12.5%). **Conclusions.** STEMI type of acute myocardial damage installed reliably higher absolute and relative risk of acute left ventricle failure ($p < 0,05$) with following intra-aortic balloon pump ($p < 0,05$), inotropic support ($p < 0,05$) and acute kidney injury with glomerular rate reduction ($p < 0,05$) in the early postoperative period. The higher absolute and relative risks of encephalopathy, as well as the possibility of supraventricular arrhythmia presented at NSTEMI patients ($p < 0,05$). All cases of transient atrioventricular blockade and early hospital mortality with reliable odds ratio, absolute and relative risks changes registered at STEMI patients ($p < 0,05$). Prospects for further research are long-term prospective observation, analysis of long-term clinical results of coronary artery bypass grafting in patients with acute myocardial infarction, as well as assessment of risk factors for long-term mortality.

Keywords: complications, coronary artery bypass grafting, immediate surgical coronary revascularization, myocardial infarction, NSTEMI, STEMI.

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1. Introduction

ACUTE myocardial infarction (AMI) is the most severe complication of coronary artery disease, resulting in acute or advanced heart failure and severe arrhythmias. Despite the progress of medicamentous and interventional treatment of patients with AMI, morbidity and mortality in this form of coronary artery disease remain high [1], [2].

Undoubtedly, an invasive strategy for the treatment of AMI is more effective than a non-invasive one. As a result, coronary angiography is performed in a significant number of patients with AMI, and, accordingly, the proportion of patients in whom for one reason or another it is impossible to perform

stenting [3].

At present, the large amount of data obtained from randomized trials confirms the advantage of early invasive strategy over conservative, so in high-risk patients, interventional intervention should be performed as early as possible [4], which is confirmed in multicenter studies [5], [6]. That is, myocardial revascularization in patients with AMI is the method of choice. At the same time, it is important to develop criteria that can influence the decision making on the choice of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) [7]. In recent years, the optimization of perioperative management of patients, including myocardial protection, has improved the effects of

treatment of emergency surgical revascularization in patients with cardiogenic shock [8]. That is, today emergency coronary artery bypass grafting is no longer considered an intervention of despair. Thus, it is important to study the results of emergency surgical myocardial revascularization in patients with AMI, which were previously considered incurable or in cases where interventional cardiology is ineffective.

However, despite the success of interventional cardiology, indications for coronary artery bypass grafting in acute myocardial infarction, according to the recommendations, are quite limited. The long-term prognosis for primary PCI and external CABG is similar, but the average length of hospital stay for PCI is shorter. In addition, a large number of modern clinics do not always have the opportunity to accept a patient urgently for surgery [9]. Therefore, it is necessary to develop simple clear criteria for selecting patients with acute myocardial infarction for emergency surgical revascularization.

Thus, early postoperative complications are an actual problem of cardiac surgery in patients with acute myocardial infarction after emergency surgical revascularization.

The aim of this work is to conduct a prospective analysis of the immediate clinical results of the early postoperative period, to evaluate the factors of early mortality in emergency coronary bypass grafting.

2. Material and Methods of Investigation

2.1 Material of Investigation

The work was performed in the departments of endovascular surgery and angiography, clinical diagnostic department, radiological diagnostics department, clinical diagnostic laboratory of the Kyiv City Heart Center "Heart Institute of the Ministry of Health of Ukraine" (Kyiv). The set of clinical material was carried out during 2011-2015. The research was based on the observation of 129 patients with acute myocardial infarction (AMI). Of these, 100 patients were diagnosed with acute ST-segment elevation myocardial infarction (STEMI), and 29 were diagnosed as acute ST-segment elevation myocardial infarction with ST-clinical elevation). In all patients, the time from the onset of clinical symptoms was less than 12 hours. The ratio of men and women in the work was 87 (67,4%) to 42 (32,6%). The age of patients ranged from 38,0 to 78,0 years, with an average of $62,0 \pm 12,5$. Criteria for inclusion of patients in the study were: 1) the presence of acute myocardial infarction with elevation of the ST segment (STEMI); 2) acute myocardial infarction without ST-segment elevation (NSTEMI); 3) carrying out coronary ventriculography.

According to coronary angiography, in 129 patients included in the study, in general 370 affected vessels were detected - an average of 2,87 per patient. One-vascular lesion was found in 2 cases (1,6%), two-vascular - in 13 cases (10,1%), with the vast majority of patients with three-vascular lesion - 114 people. (88,3%). At the same time, the lesion of

the trunk of the left coronary artery was found in 89 cases (69,0%). Revascularization in all patients was performed up to 12,0 hours after the onset of myocardial infarction. Coronary artery bypass grafting was performed using a noncardioplegic technique with intermittent aortic compression and moderate hypothermia ($28,5 \pm 0,5^{\circ}\text{C}$). Each patient was fitted with 2,0 to 3,0 shunts. The average number of imposed shunts per patient was $2,70 \pm 0,4$. The average duration of artificial circulation was $61,0 \pm 2,60$ minutes.

The hospital observation period was 14,0-20,0 days, on average $16,0 \pm 2,80$ days after emergency surgical revascularization. During this period, the frequency of intermediate and endpoints was assessed: the need for inotropic support for more than 48 hours, the necessity for intra-aortic balloon counter pulsation (IABP), kidney injury and respiratory failure, the need for rethoracotomy, the episodes of complete atrioventricular block, occurrence of encephalopathy, nosocomial mortality, and supraventricular tachycardia.

2.2 Methods of Investigation

The following research methods were used: clinical, laboratory (blood biomarkers levels (C- and T- troponin, myoglobin, MB-fraction of creatine phosphokinase)), electrocardiography (ECG in 12 standard leads), advanced electrocardiotopography (ECG in 60 leads), 24-hour (by Holter) ECG monitoring, 3D-echocardiography and doppler echocardiography, coronary angiography (CAG), shuntography.

Diagnostic and control CAG, coronary ventriculography (CVG) and coronary shuntography (CSHG) were performed on an angiographic device AXIOM Artis FA by "Siemens" (Germany), equipped with an electron-optical transducer with image registration on a matrix 512 per inch in the international medical format DICOM. Direct measurement of blood pressure and ECG monitoring is performed using the AXIOM Sensis Information System, which was part of the angiographic complex. The evaluation of the results of coronary angiography and coronary artery bypass grafting was performed quantitatively with the help of angiographic programs specially integrated into the computer system. Calculations were performed in the end-diastolic phase (in the absence of overlapping images of the branches of coronary arteries) in orthogonal projection. All stenotic lesions of the coronary arteries and shunts were analyzed for their radiographic morphological features according to the ACC/AHA classification.

2.3 Statistical Procedures

The obtained qualitative and quantitative clinical and instrumental data were entered according to the protocol of the investigation into a computer database. Statistical calculations of the research data was performed using the program modules of "Statistica 7.0" (Statsoft, USA).

In the biometric analysis of selected data used the following methods and tools of mathematical statistics: Kolmogorov-Smirnov criterion with Lilliefors correction and Shapiro-Wilk

criterion; to compare quantitative values U Wilcoxon homogeneity criterion and Mann-Whitney test were used. For qualitative features, the χ^2 criterion with the Yates correction, Fisher's exact F-test, were used. Comparison of quantitative values in several unrelated groups was performed by analysis of variance (ANOVA). The analysis of the probability of outcomes in the investigation was performed by the Kaplan-Meier method. Quantitative data are presented as $M \pm m$ (where M is Mean, and m is standard deviation). At $p < 0,05$ the results were considered statistically significant.

3. Results

Inotropic support for more than 48 hours in the postoperative period was used in 79.8% of patients (103 people). At the same time, the additional risk of this endpoint in patients with STEMI was 85.0%. Indicators of absolute risk (AR,%), relative risk (RR) and odds ratio (OR) are presented in Table 1.

Table 1. The need for inotropic support in patients with acute infarction in the postoperative period, depending on the type of myocardial injury

	AR, %	ARR	RR	OR
STEMI n=100	99,0	85,0	7,18	618,75
NSTEMI n=29	14,0		[2,89-17,9]	[66,4-5813,9]

It also confirmed the position that the severity of myocardial damage before surgical revascularization is a factor that complicates the early activation of patients and increases the duration of treatment in the intensive care unit, table 2.

Table 2. Peculiarities of the postoperative period in emergency surgical revascularization depending on the type of myocardial injury

	STEMI	NSTEMI	p
Duration of inotropic therapy, h.	68,9±16,4	52,3±8,4	<0,05
Duration of respiratory support, h.	36,8±8,2	24,2±7,8	<0,05

Duration of treatment in the intensive care unit, h.	78,7±13,7	63,8±9,4	<0,05
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Note: p - reliability of the difference in data between the observation groups.

The need for intra-aortic balloon counter pulsation (IABP) in patients with acute myocardial infarction during surgery occurred in 27,1% of cases (35 patients out of 129). At the same time, the absolute risk of left ventricular failure followed by IABP procedure in the STEMI group was 32,0% versus 10,0% in the NSTEMI group, with risk reduction of 22,0% in group 2. Relative risk indexes were also established ($p < 0,05$) and odds ratios ($p < 0,05$) of IABP in patients of the STEMI group, table 3.

Table 3. Risk of left ventricular failure during emergency surgical revascularization, depending on the type of myocardial injury

	AR, %	ARR	RR	OR
STEMI n=100	32,0	22,0	3,09	4,08
NSTEMI n=29	10,0		[1,02-9,39]	[1,15-14,5]

One of the most important steps in clinical research is the choice of an endpoint that characterizes the disease and objectively evaluates the effect of surgery. In the cumulative analysis of the likelihood of acute left ventricular failure (Kaplan-Meier method), the median of the event was established after 6,69 days, with reliable indicators of the Log-Rank test after 2,73 days ($p = 0.006$), Figure 1.

Acute kidney injury after emergency coronary bypass grafting was registered in 5,4% of cases (7 people) among all examined patients (129 people). All patients with a decrease in glomerular filtration rate below 50.0 ml / min. were assigned to the STEMI group in the preoperative period.

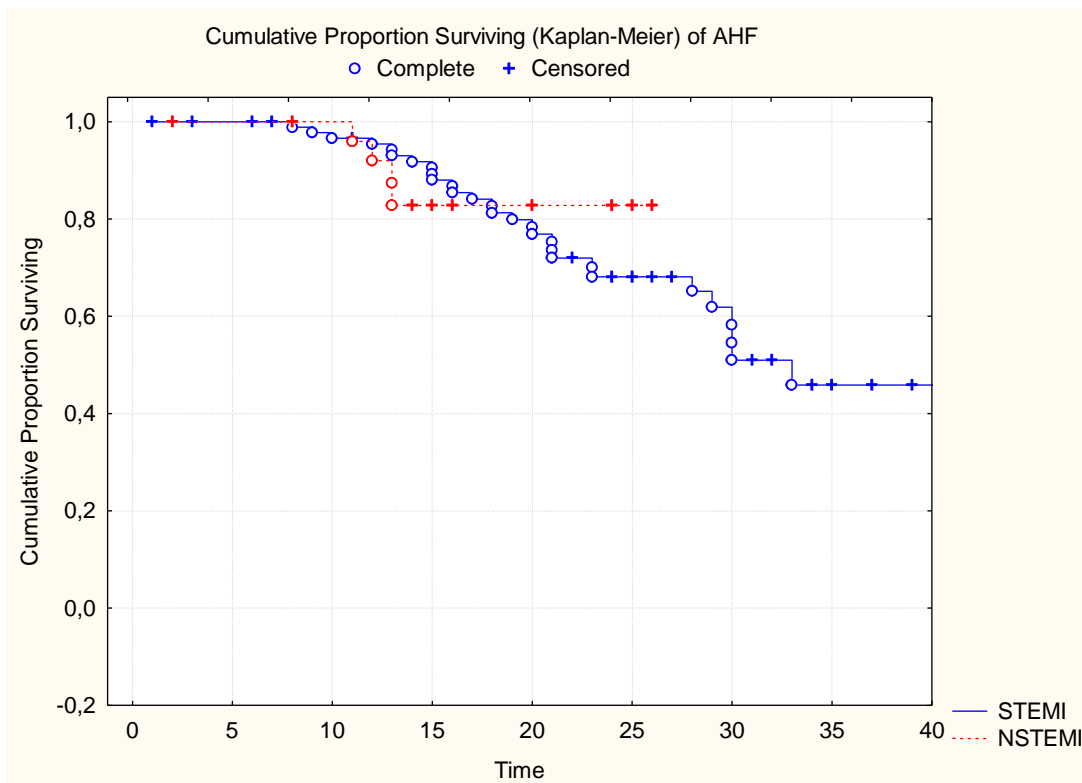


Fig. 1. Cumulative analysis of the likelihood of acute left ventricular failure in patients with acute infarction after surgical revascularization

The additional risk of acute kidney injury after emergency surgical revascularization corresponded to the absolute risk and severity of myocardial injury (7.0%), with significant evidence of the relative risk ($p < 0,05$) and odds ratio ($p < 0,05$), table 4.

Table 4. The risk of acute kidney injury in the postoperative period depending on the type of myocardial injury

	AR, %	RR	OR
STEMI n=100	7,0	203,07 [6,13-677,3]	218,28 [6,53-734,6]
NSTEMI n=29	0,0		

The frequency of respiratory failure in the early postoperative period was set at 7.0% (9 patients), table 5.

Table 5. The risk of respiratory failure in the postoperative period depending on the type of myocardial injury

	AR, %	ARR	RR	OR
STEMI n=100	8,0	5,0	2,32 [0,30-17,8]	2,43 [0,29-20,4]
NSTEMI n=29	3,0			

Prolonged mechanical ventilation occupied the main place in the structure of respiratory complications among the examined patients. At the same time, the absolute risk of respiratory failure after surgical revascularization in patients with acute myocardial infarction on the background of ST

segment elevation was set at 8,0% versus 3,0% in the absence of ST segment elevation and absolute risk reduction was set at 5,0%

There were also established significant changes of the relative risk ($p < 0,05$) and the odds ratio ($p < 0,05$) of respiratory complications in the presence of acute myocardial injury of the STEMI type, table 5.

At the same time, the absolute risk of rethoracotomy after coronary artery bypass grafting was 3,0% (STEMI) and 3,4% (NSTEMI). It was noted that the type of acute myocardial injury was not a determining factor for this complication, and the relative risk and odds ratio were unreliable ($p > 0,05$), table 6.

Table 6. Rethoracotomy in the postoperative period depending on the type of myocardial injury

	AR, %	RR	OR
STEMI n=100	3,0	0,87 [0,09-8,06]	0,87 [0,09-8,67]
NSTEMI n=29	3,4		

The absolute risk of encephalopathy in patients with NSTEMI is set at 10,3%, and in the STEMI group – 6,0%, the relative risk is 0,58 [0,15-2,18], the odds ratio is 0,55 [0,13-2,37], table 7.

Table 7. The risk of encephalopathy in the postoperative period depending on the type of myocardial injury

	AR, %	RR	OR
STEMI n=100	6,0	0,58 [0,15-2,18]	0,55 [0,13-2,37]
NSTEMI n=29	10,3		

The absolute risk of transient atrioventricular (AV) block in patients with STEMI type of myocardial injury was 4,0% versus 0,0% in patients with NSTEMI type of acute infarction, with significant relative risk ($p < 0,05$) and odds ratio ($p < 0,05$), table 8.

Table 8. The risk of transient AV block in the early postoperative period depending on the type of myocardial injury

	AR, %	ARR	RR	OR
STEMI n=100	4,0	4,0	116,0 [3,46-391,0]	120,8 [3,58-410,8]
NSTEMI n=29	0,0			

The absolute risk of supraventricular tachycardia in the STEMI group was 9,0%, while in NSTEMI patients – 21,0; relative risk – 0,44 [0,17-1,12], odds ratio – 0,38 [0,12-1,17], table 9.

Table 9. The risk of supraventricular tachycardia in the early postoperative period depending on the type of myocardial injury

	AR, %	RR	OR
STEMI n=100	9,0	0,44 [0,17-1,12]	0,38 [0,12-1,17]
NSTEMI n=29	21,0		

Postoperative mortality in patients with acute myocardial infarction was 12.4% (16 clinical cases), Figure 2.

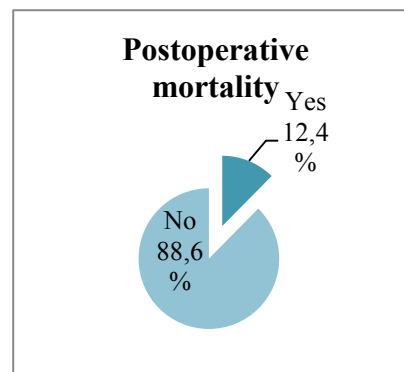


Fig. 2. Mortality in the early postoperative period in patients with acute myocardial infarction after surgical revascularization

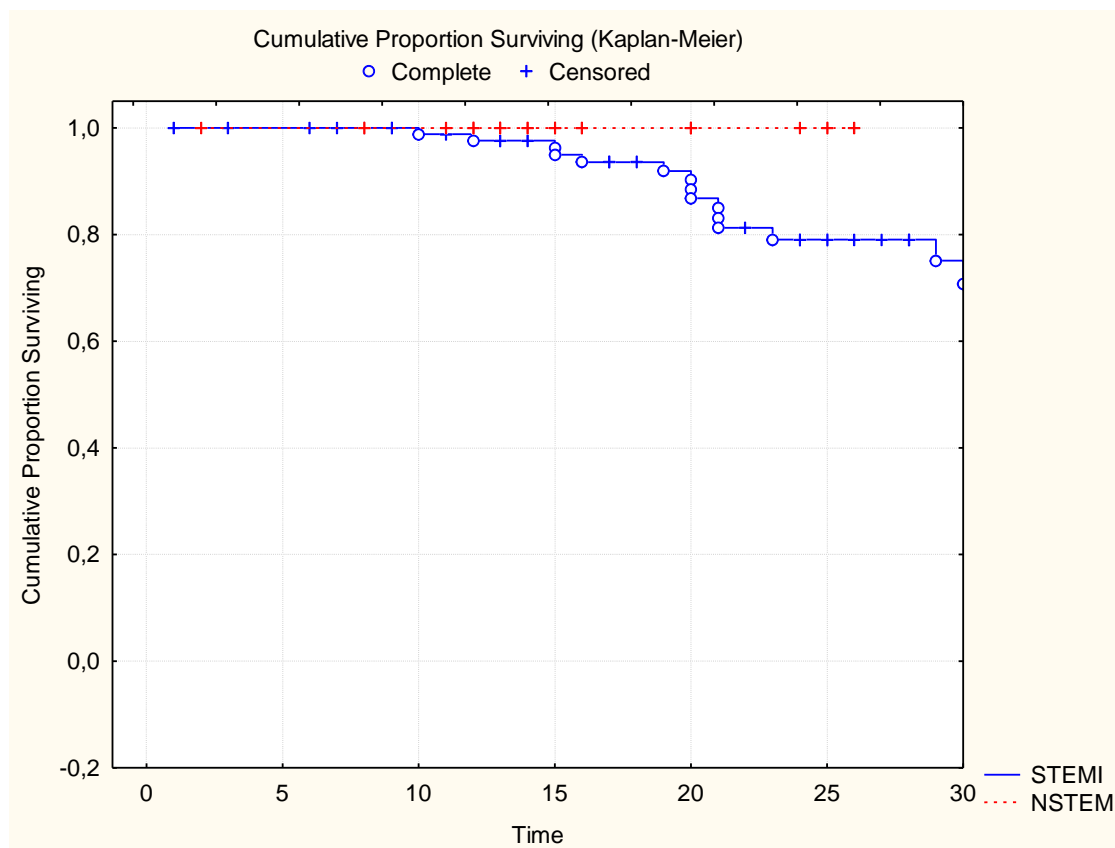


Fig. 3. Cumulative analysis of survival according to Kaplan-Meier in patients with acute myocardial infarction in the early postoperative period

At the same time, according to the cumulative analysis of Kaplan-Meier survival, all cases of postoperative mortality were registered in patients who had myocardial infarction with ST segment elevation with significant Log-rank test (2,74; $p = 0,006$), Figure 3.

The absolute risk of mortality in the STEMI group was 16,0% with identical ARR, significant relative risk ($p < 0,05$) and odds ratio ($p < 0,05$), table 10.

Table 10. Absolute and relative risks, odds ratio of postoperative mortality depending on the type of myocardial injury

	AR, %	ARR	RR	OR
STEMI n=100	16,0	16,0	464,16 [1,41-536,9]	552,38 [1,67-845,6]
NSTEMI n=29	0,0			

The ratio of acute mitral regurgitation (followed by mitral valve replacement) and early postoperative mortality was also reliable: Pearson's $\chi^2 - 12,76$ ($p = 0,003$), conjugation coefficient $\eta - 0,336$ ($p < 0,001$), table 11.

Table 11. Acute mitral regurgitation, relative risk and odds ratio of cardiogenic shock in patients with myocardial infarction and ST segment elevation

	RR	OR
Indexes	2,408 [1,853-3,963]	11,11 [2,35-52,59]

The relative risk and odds ratio of early mortality were reliable ($p < 0,05$), as evidenced by the confidence interval.

4. Discussion

However, our study identified a high absolute risk and a probable relative risk of the need for inotropic support in the postoperative period in the presence of STEMI, as well as the occurrence of left ventricular failure followed by IABP procedure. The risk of left ventricular failure was confirmed by the Kaplan-Meier method by log-rank criterion. Acute kidney injury with decreased glomerular filtration rate has been reported in patients in the STEMI group, with higher absolute and relative risk, and odds ratio. Similar results were obtained in Dieberg G et al., who proved that the type of myocardial damage is an important prognostic factor in early postoperative mortality - in patients with viable myocardium who underwent myocardial revascularization. In this case, there were significantly lower rates of serious cardiovascular complications, re-hospitalizations, progression of chronic heart failure, compared with patients who did not perform revascularization of a viable myocardium [10].

In our own study, the assessment of the hard (inflexible) endpoint (hospital mortality) confirmed the presence of a high absolute risk of mortality in the STEMI group, with probable odds ratio, relative risk and level of cumulative survival

according to the analysis of Kaplan-Meier. During the 1st day 2 deaths were registered, between 2-5 days - 8 deaths, for the period of 6-14 days the mortality rate was 6,0%, the total hospital mortality rate was 16,0%. No episodes of death were reported after the 14th day of hospital stay. Mortality had a close link to acute heart failure, cardiogenic shock and acute mitral regurgitation. A prospective analysis of mortality by cause was also performed, which, in summary, allows to determine the important role of the severity of myocardial damage as a prognostic factor during the postoperative period.

A study by Pieri M. et al., which included 7,313 patients with acute coronary syndrome, showed about significantly higher level of cardiac mortality in the optimal drug therapy group than in patients who underwent surgical myocardial revascularization. That is, the authors insist on the possibility of emergency surgical myocardial revascularization in the presence of acute myocardial infarction, and survival, according to these authors depends on the initial value of ejection fraction of left ventricle [11].

In another study, Koerich C. et al., in evaluating the treatment outcomes of patients with severe coronary artery disease and left ventricular systolic dysfunction who underwent CABG, showed that in patients who were assessed for myocardial viability, the postoperative survival rate was significantly higher compared to with patients in whom only coronary angiograms were analyzed before surgery and amounted to 97,0 and 79,0%, respectively ($p < 0,05$). The authors also emphasize that in the first hours and days after surgery, in the group with a viable myocardium, smaller amounts of catecholamine support were required [12].

The analysis of the direct results of emergency surgical revascularization in patients with acute myocardial infarction revealed that the predominant position in the structure of respiratory complications among the examined patients was prolonged mechanical ventilation (7,0%), high absolute (79,8%) and probable relative ($p < 0,05$) risk of need for inotropic support in the postoperative period, high level (32,0%) and probable odds ($p < 0,05$) of development of left ventricular failure followed by intra-aortic balloon counter pulsation (27,1%; $p < 0,05$), significant relative risk and odds of developing acute kidney injury ($p < 0,05$), transient atrioventricular block ($p < 0,05$) in the presence of STEMI.

In the work of Rudenko A.V. and Zhurba O.O. an analysis of the results of coronary artery bypass grafting of patients treated at the National Institute of Cardiovascular Surgery named after M.M. Amosov in the period from 2009 to 2013 was done. In this study, unfavorable factors of intraoperative and postoperative complications recognized unstable hemodynamics, intraoperative arrhythmias, intraoperative bleeding and ECG changes during surgery, mortality in isolated coronary artery bypass surgery in 2013 was 0.4% [13], [14].

In our study, patients with acute myocardial infarction type NSTEMI verified a higher absolute (10,3%), probable relative risk and chances of acute encephalopathy ($p < 0,05$), a greater

number of clinical cases of supraventricular tachycardia (20,7%, $p < 0.05$).

Estimation of the level of early postoperative mortality (12,4%) proved the probable relative risk ($p < 0.05$) and the odds ratio ($p < 0.05$) of mortality in the STEMI group, which was confirmed by the analysis of cumulative survival by Kaplan-Meier method (criterion) log-rank 2,74; $p = 0,006$. Mortality in the STEMI group was associated with previously diagnosed acute heart failure (56,2%), the onset of cardiogenic shock (31,3%) and the development of acute mitral regurgitation (12,5%).

According to the American Association of Cardiothoracic Surgeons, mortality from coronary artery bypass grafting depends on the surgical technique and is, in the analysis of a number of studies, 1,4% without artificial circulation and 2,3% with artificial circulation in men, 1,7% and 3,6% accordingly, in women. The authors also indicate that coronary artery bypass graft surgery on a working heart can be a safe method of performing interventions for almost all categories of patients in need of surgical correction of coronary artery disease, and can be used in 97.0% of cases [15].

Our results differ from those presented by Pidgain L. V. et al. relative to the prognostic value of acute mitral regurgitation of ischemic origin. All patients underwent coronary artery bypass graft surgery and mitral valve plastic surgery with a ring or sutures. The authors indicate that the course of the early postoperative period was uncomplicated, there were no cases of sudden death [16]. Foreign studies also indicate that the addition of mitral valve plastics to coronary artery bypass graft surgery in patients with moderate ischemic mitral regurgitation may improve cardiac function, reverse left ventricular remodeling, and reduce mitral regurgitation [17], [18].

5. Conclusions

In this prospective study, the effectiveness of emergency surgical revascularization in patients with acute myocardial infarction was evaluated, the results of the early postoperative period were analyzed and the factors of early mortality were determined.

1. The analysis of the direct results of emergency surgical revascularization in patients with acute myocardial infarction revealed that the predominant place in the structure of respiratory complications among the examined patients was prolonged mechanical ventilation (7,0%), high absolute (79,8%) and reliable relative ($p < 0,05$) risk of need for inotropic support in the postoperative period, high level (32,0%) and odds ratio ($p < 0.05$) of development of left ventricular failure followed by intra-aortic balloon counter pulsation (27,1%, $p < 0, 05$), significant relative risk and odds of developing acute kidney injury ($p < 0,05$), and transient atrioventricular block ($p < 0,05$) in the presence of STEMI.

2. Patients with acute myocardial infarction with NSTEMI type verified higher absolute (10.3%), probable relative risk and odds of acute encephalopathy ($p < 0,05$), higher percentage

of clinical cases with supraventricular tachycardia (20,7%, $p < 0,05$).

3. It has been proven that all cases of transient atrioventricular blockade were registered in patients who had previous acute myocardial infarction with ST segment elevation in the preoperative period, significant odds ratio, absolute and relative risks ($p < 0,05$).

4. It was found that the main structure of respiratory complications among the examined patients was due to prolonged mechanical ventilation, but the difference between the groups in terms of STEMI and NSTEMI odds ratio and relative risk was insignificant ($p > 0,05$).

5. Estimation of the level of early postoperative mortality (12,4%) showed a significant increase in the probable relative risk ($p < 0,05$) and odds ($p < 0,05$) in the STEMI group, which was confirmed by the analysis of cumulative survival by the Kaplan-Meier method (log-rank criterion – 2,74, $p = 0,006$). Mortality in the STEMI group was associated with previously diagnosed acute heart failure (56.2%), the onset of cardiogenic shock (31.3%) and the development of acute mitral regurgitation (12.5%).

6. In the postoperative period of emergency surgical revascularization during acute infarction, risk factors should be carefully assessed to predict early postoperative mortality - changes in left ventricular systolic dysfunction, the development of kidney injury, the presence of pulmonary hypertension, onset of atrioventricular block during intervention.

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