

Stratification risk score of cardiovascular events in patients with myocardial infarction in combination with comorbid and surgical pathology

The aim of the work: to study the features of physical and biochemical parameters response of the functional state of the body in patients with myocardial infarction (MI) in combination with comorbid pathology (CP), to identify the relationship between marker and limited parameters of the functional state of the body and the risk of cardiovascular events.

Materials and Methods. 371 patients with myocardial infarction with comorbid pathology were investigated, who were consistently included in the prospective study. The basic functional indicators of the body of a patient with MI with CP, as well as their interrelations with the main risk score, clinical markers of physical activity tolerance and Charlson comorbidity index (CCI) were studied.

Results and Discussion. Risk rates on the GRACE score in patients with MI with CP have a direct correlation (point biserial correlation) with indicators of age ($r = 0.267$; $P < 0.0001$), heart rate ($r = 0.159$; $P = 0.028$), respiratory rate ($r = 0.248$; $P = 0.001$), glucose levels ($r = 0.197$; $P = 0.007$), creatinine ($r = 0.154$; $P = 0.033$) and Charlson Comorbidity Index ($r = 0.275$; $P < 0.0001$). The inverse correlation was observed between the levels of risk on the GRACE score and hemoglobin levels ($r = -0.159$; $P = 0.03$), total cholesterol ($r = -0.217$; $P = 0.003$), LDL ($r = -0.292$; $P < 0.0001$), SpO_2 ($r = -0.178$; $P = 0.017$), the number of lymphocytes ($r = -0.169$; $P = 0.02$). An inverse correlation was observed between the level of comorbidity according to CCI and the six-minute walk test on the 10th, 30th and 90th day after the onset of MI development ($r_{10} = -0.318$; $r_{30} = -0.397$; $r_{90} = -0.425$; $P < 0.0001$).

The analysis of specificity and sensitivity of the six-minute walk test on the 10th, 30th and 90th day of rehabilitation of post-infarction patients with CCI values > 2 , showed the maximum specificity (1.0) and the predictive value of the positive result (1.0) of this marker in the comorbid patients for $6MWT_{10} = 83.5-98$ m (95% confidence interval (0.672-0.828), $P = 0.037$); $6MWT_{30} = 147-166.5$ m (95% confidence interval (0.766-0.904), $P = 0.005$ and $6MWT_{90} = 199.5-227.5$ m (95% confidence interval (0.741-0.933), $P = 0.005$).

Key words: myocardial infarction; surgical pathology, risk of cardiovascular events, GRACE score, Charlson comorbidity index.

Introduction. Cardiovascular disease remains the most common cause of death throughout the world. According to the Global Burden of Disease, they account for 31.5 % of all deaths and 45 % of deaths from non-communicable diseases. More than 75 % of all cardiovascular mortality occurs in low and middle income countries, and in Ukraine, cardiovascular mortality is 66.7 % [1–4].

Introduction and improvement of new, first of all cardiosurgical methods of treatment of acute coronary syndromes, during the last decade significantly improved the results of treatment, which led to a significant reduction in mortality and cardiovascular outlook in general. However, the provision of full medical care for patients with myocardial infarction (MI) with comorbid pathology (CP) remains a complex multidisciplinary medical problem that needs to be solved both during the acute period of the disease and at the stages of rehabilitation [5]. It is clear that the maximum threats of the combined pathology are manifested in the acute phase of the disease, therefore, the task of evaluation and stratification of risks not only in patients with myocardial infarction, but also in other acute conditions, in particular with the need for surgical intervention, is especially relevant. A large number of cardiac complications of the perioperative

period requires a detailed examination before surgery and the identification of risk groups for adverse cardiac events, targeted intraoperative functional monitoring with a view to timely diagnosis of acute coronary events. And if the assessment of cardiovascular events (CVE) risks in the uncomplicated surgical pathology is generally well understood today, the combination of acute surgical pathology with other diseases requires a balanced integrated approach with an assessment of total risk [6–9].

The aim of the work: to study the features of physical and biochemical parameters response of the functional state of the body in patients with myocardial infarction in combination with comorbid pathology, to identify the relationship between marker and limited parameters of the functional state of the body and the risk of cardiovascular events.

Materials and Methods. 371 patients with myocardial infarction with comorbid pathology were investigated, which were consistently included in the prospective study. The main functional indicators of the body of a patient with MI with CP were studied, as well as their relationship with the main risk score, clinical markers of physical activity tolerance and Charlson comorbidity index (CCI). The diagnosis

was established according to the effective protocols of treatment and rehabilitation of patients with MI [10–12]. Criteria for involving patients in the study were the confirmed diagnosis of MI and written informed consent of patients to participate in the study. The criteria for non-involvement of patients in the study were acute infectious and mental illnesses, decompensation of concomitant pathology, presence of hemodynamically significant heart defects and surgical revascularization of the infarct-dependent vessel. To evaluate the degree of comorbidity in patients with MI with concomitant pathology, Charlson comorbidity index [13] was used.

The morphometric parameters of intracardiac hemodynamics were evaluated using an echocardiographic method on Philips HD11XE (USA) device, in accordance with recommendations for ultrasound examination of the American Society for Echocardiography and the European Association for Echocardiography (ASE / EAS 2015). Electrocardiograms were registered with the help of UTAS ECG device. Laboratory methods were performed according to standard methods and included a general blood test, a coagulogram, a biochemical blood test (glucose, bilirubin, transaminase, creatinine, urea, uric acid, blood plasma lipid spectrum: total cholesterol, triglycerides, high and low density lipoproteins).

Functional reserves of the cardiovascular system were determined by the method of point scoring of its individual parameters: with a size of the left ventricular ejection fraction more than 55 % – 1 point, 45–55 % – 2 points, 30–45 % – 3 points and less than 30 % – 4 points. In the same way, according to NYHA the heart failure was evaluated: functional class I (FC) – 1 point, FC II – 2 points, FC III – 3 points and FC IV – 4 points and the risk status of cardiovascular events according to the rehabilitation classification (Nikolaeva L.F., Aronov D.M., 1988): FC I – 1 point, FC II – 2 points, FC III – 3 points and FC IV – 4 points. Post-infarction patients were divided into groups of small, medium and high risk, with the corresponding assignment of 1, 2 and 3 points according to the GRACE score and the American Heart Association Cardiovascular Risk Scale (ANA) [14,15]. The six-minute walk test [16] was performed and evaluated on the 10th, 30th and 90th day after the patient was admitted to the clinic (6MWT₁₀, 6MWT₃₀ and 6MWT₉₀, respectively).

Statistical analysis was performed using MS Excel 2000 and EViews 5.1 software. For quantitative variables average values and standard deviations were calculated, absolute variables and percentage shares for each category were calculated for categorical variables. For quantitative variables, the statistical

significance of the differences between groups of patients with concomitant pathology and non-concomitant pathology was investigated using the Student t-criterion for independent samples. The analysis of the comparability of the distribution of qualitative (categorical) characteristics in the groups was carried out using criterion χ^2 (categorical variables are presented as absolute numbers for each category). In the analysis of relationships between quantitative indicators, the standard Pearson correlation coefficient was calculated; between the quantitative and categorical (in 2 categories) indicators the point biserial correlation coefficient was used, between quantitative and categorical (more than 2 categories) – dispersion ANOVA analysis and coefficient η^2 (eta-square), while the analysis of the relationships between two categorical indicators is the ratio of Yule's coefficient association (the relationship was considered as confirmed, when the coefficient of association according to the module exceeded 0.5). When using all other statistical criteria and means of analysis, the differences and relationships were statistically significant when $P < 0.05$ [17].

This study was approved by the decision of the Ethics Commission of I. Horbachevsky Ternopil State Medical University.

Results and Discussion. As a result of previous studies, interrelation was established between certain categories of concomitant pathology in patients with myocardial infarction and the main functional indicators of the body condition, marker and limited parameters for cardiovascular and non-cardiovascular comorbid pathology were found. Moreover, there were no unified markers of the functional state of the body in patients with MI with comorbid pathology in general and in its separate forms among the most commonly used clinical, laboratory and hemodynamic indices. Instead, in the analysis of Charlson comorbidity index in patients with MI with CP, it was found that this marker reflected not only the degree of comorbidity in the studied cohort of patients, but also proved to be universal for predicting the degree of functional disorders, both in certain nosologies of concomitant pathology, and in comorbid patients in general [14,17,18].

Taking into account the potential value of the generally accepted for today cardiac score and risk calculators for CVE to increase the estimation objectivity of the prognosis and functional reserves of a comorbid patient in any acute state, the levels and relationships of the risk of CVE on the GRACE score, the risk score of the cardiovascular events according to ANA, Charlson comorbidity index and levels of

physical activity tolerance in the dynamics on the 10th, 30th and 90th days since the onset of the MI development. It was found that all of the risk factors for cardiovascular events and exercise tolerance (functional class according to NYHA, left ventricular ejection fraction, rehabilitation grade and risk of cardiovascular events by ANA and GRACE score) in the sample of patients with MI with CP were high and very high (Table 1).

Table 1. Indicators of risk prognosis of cardiovascular events and functional cardiac reserves in patients with acute myocardial infarction with comorbid pathology

Indicator	(M±SD)
Risk according to GRACE, points	2.866±0.342
Risk according to AHA, points	2.660±0.627
FC according to EF, points	2.930±0.763
FC according to NYHA, points	3.345±0.567
Rehabilitation FC, points	3.278±0.718
CCI, points	4.386±0.984
6MWT ₁₀ , m	76.084±35.206
6MWT ₃₀ , m	133.809±49.63
6MWT ₉₀ , m	207.58±74.071

Note: FC – functional class; EF – ejection fraction; CCI – Charlson comorbidity index; 6MWT – six-minute walk test

Further in-depth statistical analysis revealed that the number of patients with maximum risk in the baseline cardiac GRACE score was significantly higher in patients with MI with a CP than without CP (Table 2).

Table 2. Dependence of the risk level of cardiovascular event according to GRACE score depending on the comorbid pathology

Indicator	Value
The share of high risk individuals in a group without CP (3 points according to GRACE)	0.462
The share of high risk individuals in a group with CP (3 points according to GRACE)	0.894
Z-test	-4.399
P-value	<0.0001

The study also found that risk levels according to GRACE score in patients with MI with comorbid pathology (Table 3) had a direct correlation with age, heart rate (HR), respiratory rate (RR), glucose levels, creatinine, and Charlson comorbidity index. The inverse correlation was observed in studying the relationship of risk factors according to GRACE score with hemoglobin, total cholesterol, LDL, SpO₂, and the number of lymphocytes. It should be noted

Table 3. Dependence of general-clinical quantitative indices in patients with MI on the risk of cardiovascular event on GRACE score

Indicator	Average for patients with grace3	Average for patients with grace2	Standard deviation	Point-biserial correlation	P-value
Age, years	67.982	59.885	10.419	0.267	<0.0001
HR in the acute phase of MI, bpm	88	74.923	28.241	0.159	0.028
SBP in the acute phase of IM, mm Hg	129	135.39	35.285	0.062	0.392
RR br/min	20.878	18.308	3.569	0.248	0.001
Hemoglobin, g/l	130.94	141.08	22.1	-0.159	0.03
Leukocytes, x10 ⁹ /l	9.856	10.485	3.694	-0.059	0.422
ESR, mm/h	20.644	14.308	15.771	0.14	0.057
Lymphocytes, %	19.216	25.577	13.032	-0.169	0.02
Glucose, mmol/l	8.98	6.483	4.283	0.197	0.007
Creatinine, mcmol/l	117.56	76.5	91.61	0.154	0.033
Troponin T, ng/ml	1787.9	1131.9	916.2	0.129	0.032
TC, mmol/l	4.589	5.543	1.545	-0.217	0.003
HDL, mmol/l	1.12	1.349	0.523	-0.148	0.055
LDL, mmol/l	2.913	4.001	1.243	-0.292	<0.0001
SpO ₂ , %	93.513	96.227	5	-0.178	0.017
CI, points	4.831	3.527	1.628	0.275	<0.0001

Note: HR – heart rate, SBP – systolic blood pressure, RR – respiratory rate, ESR – erythrocyte sedimentation rate, TC – total cholesterol, HDL – high-density lipoproteins, LDL – low-density lipoproteins, CI – comorbidity index

that the most indicators of the functioning of organs and systems of a comorbid patient with MI reflect their stress in conditions of serious acute pathology, which is a myocardial infarction. This is evidenced by the high levels of glucose, creatinine, heart rate and respiratory rate in high-risk patients. However, some systems exhibit certain degrees of their exhaustion, as indicated by lowered hemoglobin, total cholesterol, low density lipoprotein, lymphocytes, oxygen saturation with high risk of cardiovascular event.

As a result of the study, it was found that a high reliability ($P < 0.0001$) relationship was observed between the presence of comorbid pathology and the categorical indicators of acute heart failure according to Killip, functional class according to NYHA, functional class according to rehabilitation grade and risk level for ANA (Table 4). The obtained data confirm the high risks in patients with MI with CP and allow the use of these scores for an integrated assessment of the risk level of CVE among comorbid patients.

Similarly, highly significant ($P < 0.0001$) direct correlation was observed between the degree of comorbidity by CCI and the six-minute walk test on the 10th, 30th and 90th day from the onset of the MI (Table 5), which confirms the possibility of using the 6MWT as a marker tolerance to the physical activity of post-infarction patients with comorbid pathology at all stages of the rehabilitation process.

Analysis of the specificity and sensitivity of the six-minute walk test on the 10th day of rehabilitation of postinfarction patients when the values of Charlson comorbidity index > 2 showed a high specificity and predictive value of the positive result of this marker for comorbid patients (Table 6, Fig. 1).

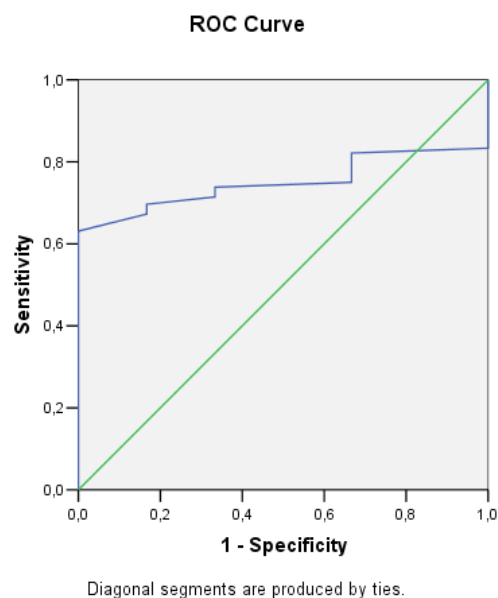


Figure 1. ROC-curve of sensitivity and specificity of 6MWT₁₀ when CI values > 2

Note. Area under the curve 0.75, standard error 0.040; $P = 0.004$.

Table 4. Dependence of functional categorical indices in patients with MI on comorbid pathology

Indicator	FC according to Killip	FC according to NYHA	FC according to rehabilitation classification	Risk according to AHA
Pearson's contingency coefficient	0.258	0.237	0.286	0.370
Chuprov's contingency coefficient	0.189	0.206	0.251	0.334
Cramer's contingency coefficient	0.267	0.244	0.299	0.398
χ^2 (P-value)	<0.0001	<0.0001	<0.0001	<0.0001

Table 5. Dependence of the six-minute walk test in patients with MI on the Charlson comorbidity index

Indicator	6MWT ₁₀	6MWT ₃₀	6MWT ₉₀
Correlation	-0.318	-0.397	-0.425
T-criteria	-4.571	-5.705	-6.149
P-value	<0.0001	<0.0001	<0.0001

Table 6. Matrix for determination of sensitivity and specificity of 6MWT₁₀ when values of CCI > 2

6MWT ₁₀ value	Sensitivity	Specificity	Prognostic value of a positive result	Prognostic value of a negative result
83.5	0.63	1	1	0.09
98.0	0.80	0.33	0.97	0.06
100.5	0.81	0.33	0.97	0.06

Note. 95% confidence interval (0.672–0.828), $P=0.037$

Corresponding values for 6MWT performed on the 30th and 90th day after the onset of MI were also with the maximum specificity (1.0) and the predictive value of the positive result (1.0) for 6MWT₃₀ values of 147–166.5 m (95 % confidence interval (0.766–0.904), P = 0.005, area under the ROC curve 0.835) and 6MWT₉₀ within the limits of 199.5–227.5 m (95 % confidence interval (0.741–0.933), P = 0.005, area under ROC-curve 0.837).

The analysis of the relationship of the basic test of physical activity tolerance with certain forms of concomitant pathology revealed authentic correlations of 6MWT with concomitant pulmonary pathology and diabetes mellitus. Moreover, patients in the pulmonary profile responded with a significant decrease in the main indicator of physical activity tolerance at the early and late outpatient stages (Table 7).

The inverse correlation between 6MWT₃₀ and pulmonologic comorbidity, as well as between 6MWT₉₀ and pulmonologic comorbidity, shows that for persons with pulmonologic comorbidity, 6MWT₃₀ (early outpatient stage) and 6MWT₉₀ (late outpatient stage) are, on average, significantly lower than for

those without comorbidity. The data of our study coincide with the results of other researchers about the important role of chronic pulmonary pathology in reducing cardio respirator reserves [6]. Instead, patients with concomitant diabetes had significantly lower 6MWT indicators not only in outpatient, but also in the inpatient stage of rehabilitation (Table 8).

The evaluation of possible interactions between 6MWT and other groups of comorbid pathology including vascular pathology of cerebral and extracerebral localization, gastrointestinal tract pathology, thyroid gland pathology, nephrology and joint pathology in the described cohort of patients did not reveal any significant effect of any of them on tolerance to physical activity at the stages of rehabilitation, which allows the use of general stratification approaches for assessing the risk of CVE and rehabilitation measures. It should be noted that there is no patient in the study cohort with deep disorders of the functioning of organs and systems, therefore the results of the study apply only to comorbid patients with compensated or subcompensated status.

Table 7. Dependence of 6MWT on the stages of rehabilitation in patients with MI with comorbid pathology on the concomitant pulmonary pathology

Indicator	6MWT ₁₀	6MWT ₃₀	6MWT ₉₀
Total number of patients	188	176	174
Number of patients with PP	47	45	43
Number of patients without PP	141	131	131
Average for patients with PP	70.447	115.18	183.37
Average for patients without PP	78.149	140.59	216.11
Standard deviation	35.266	49.696	74.162
Point biserial correlation	-0.095	-0.224	-0.191
t ²	1.688	9.165	6.508
P-value	0.196	0.003	0.012

Note. PP – pulmonary pathology

Table 8. Dependence of 6MWT on stages of rehabilitation in patients with MI with comorbid pathology on the concomitant diabetes mellitus

Indicator	6MWT (10)	6MWT (30)	6MWT (90)
Total number of patients	159	149	149
Patients with diabetes	26	24	24
Patients without diabetes	133	125	125
Average for patients with diabetes	59.769	104.167	156.833
Average for patients without diabetes	79.383	139.96	212.808
Standard deviation	33.578	49.326	75.143
Point biserial correlation	-0.217	-0.268	-0.275
t ²	7.737	11.343	12.003
P-value	0.006	0.001	0.001

Given that cardiovascular disease is the most common concomitant pathology that becomes the main cause of perioperative complications and mortality, the assessment of the risks of the surgery itself and the rehabilitation period after its implementation is an urgent problem that needs to be addressed. Potentially lethal postoperative complications include, first of all, acute myocardial infarction and its complications that occur in patients with cardiovascular pathology due to coronary artery disease. More than 60 % of patients who die during a 30-day postoperative period have signs of coronary insufficiency [7]. Currently, the revised index of risk of developing cardiac complications, the RCRI-index (Lee Criteria Revised Cardiac Risk Index), developed in 1999 by T.H. Lee and colleagues is most frequently used. It is used in cases of non-cardiac surgery and includes 6 independent predictors of cardiac complications of the postoperative period: the presence of coronary heart disease (history of myocardial infarction, positive stress test, current use of nitrates for the purpose of therapy for angina pectoris, pain associated with myocardial infarction, pathological Q-wave on an electrocardiogram); – presence of heart failure (pulmonary edema, stagnant wheezing, rhythm “gallop”, radiological picture of stagnation in the system of blood vessels of the small circle of blood circulation); – presence of cerebrovascular pathology (cerebrovascular aneurysm); diabetes mellitus requiring preoperative treatment with insulin; – increased plasma creatinine levels prior to surgery (> 2 mg / dl, or creatinine clearance <60 ml / min) [7,19]. However, the complexity of a quick risk assessment and the inadequate informativity of this calculator for another comorbidity pathology, necessitates the search for other, more specific calculators for assessing the risk of CVE in case of multi-morbidity. Some studies showed the prospect of using the Charlson comorbidity index in patients with cardiac and general surgical pathology both in the acute phase and in the stages of rehabilitation [20–22].

The complexity of the search for a universal calculator for assessing the risks of a surgical multi-

morbid patient demonstrates a number of recent studies that compared the existing RENAL, PADUA, and MAP scales, and the pre-and post-surgical evaluation of the VAS surgeon. In a multi-factor analysis, based on anticoagulant / antiplatelet therapy, body mass index, surgeon's experience and Charlson concomitant pathology index, only a surgeon's forecast could reliably predict general complications (odds ratio = 5.42, $p < 0.001$) and prognosis than all radiographic parameters (ROC areas under curves were 0.76 and 0.77 for previous and postoperative VAS scores, respectively) [23]. An analysis of this and other studies [24–26] suggests that the search for adequate scores and risk calculators in patients with a surgical profile with the presence of comorbidity continues, therefore the possibility of using the main cardiovascular risk scores of cardiovascular events can find its place in the composition of universal risk calculators for an integral assessment of the functioning of the main body systems of a comorbid patient in conditions of acute pathology and in the stages of rehabilitation.

Conclusions. In patients with MI with CP in the acute phase of myocardial infarction, the severity of the risk of cardiovascular events on the GRACE score has authentic correlation with the basic hemodynamic and metabolic indicators and Charlson comorbidity degree, which allows using the GRACE calculator to stratify the risk of comorbid patients

High specificity and prognostic value of positive result of the six-minute walk test on the 10th, 30th and 90th day from the beginning of the onset of MI in the background of comorbid pathology (at CCI > 2) allows recommending the use of 6MWT as a marker of exercise tolerance for post-infarction patients with CP at all stages of the rehabilitation process.

Prospects for further research. To study the possibility of adaptation of cardiological risk scores of CVE in patients with a surgical profile with a comorbid pathology to improve risk prediction in the perioperative period and in the stages of rehabilitation.

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СТРАТИФІКАЦІЙНІ ШКАЛИ РИЗИКУ СЕРЦЕВО-СУДИННИХ ПОДІЙ У ХВОРИХ НА ІНФАРКТ МІОКАРДА В ПОЄДНАННІ З КОМОРБІДНОЮ І ХІРУРГІЧНОЮ ПАТОЛОГІЄЮ

Мета роботи: вивчити особливості реагування фізичних та біохімічних показників функціонального стану організму у хворих на інфаркт міокарда (ІМ) в поєднанні з коморбідною патологією (КП), виявити зв'язки між маркерними і лімітуючими параметрами функціонального стану організму та ступенем ризику серцево-судинних подій.

Матеріали і методи. Досліджено 371 хворого на інфаркт міокарда з коморбідною патологією, які були послідовно включені в проспективне дослідження. Вивчено основні функціональні показники стану організму хворого на ІМ з КП, а також їх взаємозв'язки з основними шкалами ризику, клінічними маркерами толерантності до фізичного навантаження та індексом коморбідності Чарльсона (ІКЧ).

Результати досліджень та їх обговорення. Ступені ризику за шкалою GRACE у хворих на ІМ з КП мають прямий кореляційний зв'язок (точково-бісерійна кореляція) з показниками віку ($r=0,267$; $P<0,0001$), частоти серцевих скорочень ($r=0,159$; $P=0,028$), частоти дихальних рухів ($r=0,248$; $P=0,001$), рівнями глюкози ($r=0,197$; $P=0,007$), креатиніну ($r=0,154$; $P=0,033$) та індексом коморбідності Чарльсона ($r=0,275$; $P<0,0001$). Обернена кореляція спостерігалася між ступенями ризику за шкалою GRACE та рівнями гемоглобіну ($r=-0,159$; $P=0,03$), загального холестерину ($r=-0,217$; $P=0,003$), ЛПНГ ($r=-0,292$; $P<0,0001$), SpO₂ ($r=-0,178$; $P=0,017$), кількістю лімфоцитів ($r=-0,169$; $P=0,02$). Прослідковувалася обернена кореляція між ступенем коморбідності за ІКЧ та тестом шестихвилинної ходьби на 10-й, 30 і 90-й день від початку розвитку ІМ ($r_{10}=-0,318$; $r_{30}=-0,397$; $r_{90}=-0,425$; $P<0,0001$).

Аналіз специфічності та чутливості тесту шестихвилинної ходьби на 10-й, 30-й та 90-й день реабілітації післяінфарктних хворих при значеннях ІКЧ>2 показав максимальну специфічність (1,0) та прогностичну цінність позитивного результату (1,0) цього маркера у коморбідних пацієнтів для значень ТШХ₁₀ = 83,5–98 м (95% ДІ (0,672–0,828), $P=0,037$); ТШХ₃₀ = 147–166,5 м (95% ДІ (0,766–0,904), $P=0,005$ та ТШХ₉₀ = 199,5–227,5 м (95% ДІ (0,741–0,933), $P=0,005$).

Ключові слова: інфаркт міокарда; хірургічна патологія; ризик серцево-судинних подій; шкала GRACE; індекс коморбідності Чарльсона.

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СТРАТИФИКАЦИОННЫЕ ШКАЛЫ РИСКА СЕРДЕЧНО-СОСУДИСТЫХ СОБЫТИЙ У БОЛЬНЫХ С ИНФАРКТОМ МИОКАРДА В СОЧЕТАНИИ С КОМОРБИДНОЙ И ХИРУРГИЧЕСКОЙ ПАТОЛОГИЕЙ

Цель работы: изучить особенности реагирования физических и биохимических показателей функционального состояния организма у больных с инфарктом миокарда (ИМ) в сочетании с коморбидной патологией (КП), выявить связи между маркерными и лимитирующими параметрами функционального состояния организма и степени риска сердечно-сосудистых событий.

Материалы и методы. Исследовано 371 больного с инфарктом миокарда с коморбидной патологией, которые были последовательно включены в проспективное исследование. Изучены основные функциональные показатели состояния организма больного с ИМ с КП, а также их взаимосвязи с основными шкалами риска, клиническими маркерами толерантности к физической нагрузке и индексом коморбидности Чарльсона (ИКЧ).

Результаты исследований и их обсуждение. Степени риска по шкале GRACE у больных с ИМ с КП имеют прямую корреляционную связь (точечно-бісерійна кореляція) с показателями возраста ($r = 0,267$; $p < 0,0001$), частоты сердечных сокращений ($r = 0,159$; $P = 0,028$), частоты дыхательных движений ($r = 0,248$; $P = 0,001$), уровнями глюкозы ($r = 0,197$; $P = 0,007$), креатинина ($r = 0,154$; $P = 0,033$) и индексом коморбидности Чарльсона ($r = 0,275$; $p < 0,0001$). Обратная корреляция наблюдалась между степеням риска по шкале GRACE и уровнями гемоглобина ($r = -0,159$; $P = 0,03$), общего холестерина ($r = -0,217$; $P = 0,003$), ЛПНП ($r = -0,292$; $p < 0,0001$), SpO₂ ($r = -0,178$; $P = 0,017$), количеством лимфоцитов ($r = -0,169$; $P = 0,02$). Проследивалась обратная корреляция между степенью коморбидности по ІКЧ и тестом шестиминутной ходьбы на 10-й, 30 и 90-й день от начала развития ІМ ($r_{10} = -0,318$; $r_{30} = -0,397$; $r_{90} = -0,425$; $p < 0,0001$).

Анализ специфичности и чувствительности теста шестиминутной ходьбы на 10-й, 30-й и 90-й день реабилитации послеинфарктных больных при значениях ІКЧ> 2 показал максимальную специфичность (1,0) и прогностическую ценность положительного результата (1,0) этого маркера в коморбидных пациентов для значений ТШХ₁₀ = 83,5–98 м (95% ДИ (0,672–0,828), $P = 0,037$) ТШХ₃₀ = 147–166,5 м (95% ДИ (0,766–0,904), $P = 0,005$ и ТШХ₉₀ = 199,5–227,5 м (95% ДИ (0,741–0,933), $P = 0,005$).

Ключевые слова: инфаркт миокарда; хирургическая патология; риск сердечно-сосудистых событий; шкала GRACE; индекс коморбидности Чарльсона.