

FUNCTIONAL CHARACTERISTICS OF PATIENTS WITH MYOCARDIAL INFARCTION WITH CONCOMITANT DISEASES OF PERIPHERAL ARTERIES AND PECULIARITIES OF APPROACHES TO THEIR REHABILITATION TREATMENT

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SUMMARY. The high prevalence of cardiological diseases and their frequent combination with different comorbid conditions lead to an increase in the number of patients whose therapeutic approaches go beyond the generally accepted standards.

The aim of this study was to analyze the relationship of the comorbid pathology of peripheral arteries with functional characteristics of patients with myocardial infarction.

Material and Methods. We examined 371 patients with acute myocardial infarction with comorbid pathology, including peripheral arterial disease (PAD), who underwent acute phase of rehabilitation. The age of patients was (66.16 ± 10.41) years. Among the surveyed, there were 249 (67.12 %) men and 122 women (32.88 %). The parameters of intracardiac hemodynamics were determined by evaluating the echocardiographic indices measured on the Philips HD11XE device, electrocardiographic cardiac activity values were studied using the ECG of the UTAS device, and the biochemical parameters of blood were determined by commonly used methods using standard test systems (Pliva-Lachema, Czech Republic).

Results and Discussion. In studying the relationship between the concomitant pathology of peripheral arteries in patients with myocardial infarction and numerical functional parameters, there was a direct correlation between the presence of vascular pathology and the duration of anamnesis of arterial hypertension, the magnitude of systolic and diastolic blood pressure, the thickness of the left ventricular walls and the size of the right ventricle, and also between available vascular pathology and comorbidity index. It was proved that PAD is an independent predictor of a worse functional state in patients with MI due to deepening of structural and functional changes in the heart.

Conclusions. Association of myocardial infarction with comorbid peripheral arterial disease is an independent predictor of a worse functional state of the body. Charlson Comorbidity Index can serve as a tool for quantifying the degree of comorbidity in patients with MI with PAD in determining the functional status and planning for rehabilitation.

KEY WORDS: myocardial infarction; peripheral arteries comorbidity; cardiac rehabilitation; Charlson Comorbidity Index.

Introduction. The high prevalence of cardiological diseases and their frequent combination with different comorbid conditions leads to an increase in the number of patients whose therapeutic approaches go beyond the generally accepted standards. Multimorbidity significantly complicates the process of diagnosis and treatment, increases the number of complications, increases the frequency and duration of hospitalization, early disability of patients, and prevents rehabilitation measures in full as well. The special literature also does not adequately cover the problem of the peculiarities of assessing the functional status of patients with myocardial infarction (MI) in conjunction with the comorbid pathology, and the adequate programs for rehabilitation for such patients have not been developed yet [1–3].

The prevalence of peripheral arterial disease (PAD) is increasing worldwide, moreover, patients with PAD have not only lowered life quality but also a high risk of cardiovascular events such as stroke, myocardial infarction and death. The results of recent studies indicate an increase in cases of PAD, especially terminal stages, with critical limb ischemia. Unlike the frequency of large amputations, cardiovascular and total mortality in such patients remains high and almost does not change compared with historical

data. The reasons for the lack of improvement in prognosis in patients with PAD remain unclear [4, 5].

The aim of this study was to analyze the relationship of the comorbid pathology of peripheral arteries with functional characteristics of patients with myocardial infarction.

Material and Methods. We examined 371 patients with acute myocardial infarction with comorbid pathology, including PAD, who underwent acute phase of rehabilitation in the Cardiology Department of the Ternopil University Hospital. Diagnosis, treatment and rehabilitation of patients were performed according to the current protocols [6–9]. The inclusion criteria in the study was a confirmed diagnosis of an acute MI and written informed consent of patients to participate in the study. Exclusion criteria: the presence of hemodynamically significant heart defects, mental illness and diseases of the internal organs in the stage of decompensation. The age of patients was (66.16 ± 10.41) years. Among the surveyed, there were 249 (67.12 %) men and 122 women (32.88 %).

The parameters of intracardiac hemodynamics were determined by evaluating the echocardiographic indices measured on the Philips HD11XE device, electrocardiographic cardiac activity values

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were studied using the ECG of the UTAS apparatus, and the biochemical parameters of blood were determined by commonly used methods using standard test systems (Pliva-Lachema, Czech Republic).

The statistical processing of the research results was carried out using standard algorithms of variation statistics, for calculations the Excel program (Microsoft Office, USA) with correlation analysis were used. To assess the reliability of the difference between the absolute values of the mean values, the Student t-criterion or the criterion χ^2 was calculated (the difference was considered to be valid at $p < 0.05$). The relationship between two features was studied using the Pearson correlation analysis (r), the connection (association) of two qualitative characteristics was estimated using association and/or

contingency coefficients, qualitative and quantitative characteristics, using the point biserial correlation coefficient [10].

Results and Discussion. In the process of a statistical analysis of the relationship between the PAD and categorical indicators of the body functional state, as well as the frequency of complications of MI, two authentic dependencies were found: the reliability of a direct relationship between the presence of comorbid vascular pathology and mortality, as well as between the presence of vascular pathology and the incidence of left ventricle aneurysm. That is, in the study cohort of patients with MI with PAD the left ventricle aneurysm and mortality are significantly more common than among persons without pathology of peripheral arteries (Table 1).

Table 1. Results of the study of the functional categorical indices relationships in patients with myocardial infarction in combination with the comorbid pathology of the peripheral arteries

Index	Number of patients with MI and PAD	Number of patients with MI without PAD	Association coefficients	χ^2	P
Men	55	194	-0.211	2.981	0.084
Women	37	85			
Paroxysmal atrial fibrillation	15	33	0.184	1.231	0.267
No paroxysmal atrial fibrillation	77	246			
Chronic atrial fibrillation	8	26	-0.04	0.036	0.85
No chronic atrial fibrillation	84	252			
1st-2nd degree atrioventricular block	7	13	0.255	1.18	0.277
No 1st-2nd degree atrioventricular block	85	266			
Cardiac asthma	23	53	0.174	1.531	0.216
No cardiac asthma	69	226			
Pulmonary edema	7	15	0.183	0.618	0.432
No pulmonary edema	85	264			
Supraventricular arrhythmia	19	66	-0.087	0.353	0.552
No supraventricular arrhythmia	73	213			
Ventricular arrhythmia	15	43	0.033	0.042	0.838
No ventricular arrhythmia	77	236			
Blocks	24	67	0.055	0.161	0.689
No blocks	68	212			
Left ventricular aneurysm	32	60	0.321	6.54	0.011
No left ventricular aneurysm	60	219			
Dressler syndrome	5	9	0.266	0.93	0.335
No Dressler syndrome	87	270			
Epistonic pericarditis	17	65	-0.145	0.933	0.334
No epistonic pericarditis	75	214			
Diastolic dysfunction	45	133	0.03	0.059	0.808
No diastolic dysfunction	44	138			
Mitral regurgitation	35	104	0.022	0.032	0.857
No mitral regurgitation	56	174			
Tricuspid regurgitation	30	97	-0.049	0.143	0.705
No tricuspid regurgitation	61	179			
Died	8	10	0.439	3.916	0.048
Discharged	84	269			

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In studying the relationship between the concomitant pathology of peripheral arteries in patients with myocardial infarction and numerical functional parameters, there was a direct correlation between the presence of vascular pathology and the duration of anamnesis of arterial hypertension, the magnitude of systolic and diastolic blood pressure, the thickness of the left ventricular walls and the size of the right ventricle, and also between

available vascular pathology and comorbidity index (Table 2). That is, in people with myocardial infarction on the background of PAD, long-term arterial hypertension with high indicators of both systolic and diastolic blood pressure, leads to structural changes in the myocardium, which in turn, deepen the systemic hemodynamic disturbances, promote development and deepening of the vascular pathology.

Table 2. Interrelations of functional numerical indices in patients with MI with comorbidity of peripheral arteries

Index	Mean value for patients with PAD	Mean value for patients without PAD	Standard deviation	The share of patients with PAD	The share of patients without PAD	Point biserial correlation coefficient	t ²	P
Age, years	67.511	65.717	10.407	0.248	0.752	0.075	2.062	0.152
Smoking, years	1.97	4.074	9.706	0.262	0.738	-0.096	2.336	0.128
Daily duality of cigarettes, pcs.	2.239	2.926	7.741	0.262	0.738	-0.039	0.389	0.533
AH anamnesis duration, years	14.04	10.902	7.668	0.302	0.698	0.188	9.05	0.003
RR /min	20.859	20.167	3.505	0.251	0.749	0.086	2.695	0.102
HR in acute period of MI, bpm	84.587	84.369	25.733	0.248	0.752	0.004	0.005	0.944
SBP in acute period of MI, mm Hg	143.91	130.18	30.174	0.248	0.752	0.197	14.878	<0.0001
DBP in acute period of MI, mm Hg	87.446	80.466	15.874	0.248	0.752	0.19	13.84	<0.001
SpO ₂ , %	93.864	94.418	4.092	0.253	0.747	-0,059	1.11	0.293
LV wall thickness, cm	1.15	1.107	0.159	0.241	0.759	0.117	4.165	0.042
RV, cm	3.195	2.162	3.223	0.276	0.724	0.143	5.818	0.017
Comorbidity index	5.132	4.383	1.829	0.248	0.752	0.177	11.919	0.001

Note: PAD – peripheral arterial disease; AH – arterial hypertension; RR – respiratory rate; HR – heart rate; SBP – systolic blood pressure; DBP – diastolic blood pressure; MI – myocardial infarction; LV – left ventricle; RV – right ventricle; SpO₂ – blood oxygen saturation.

The obtained results completely coincide with the data of other researchers regarding the mutual burden of various forms of PAD, including myocardial infarction, and diseases of the peripheral arteries [4, 11, 12]. In the largest meta-analysis, which examined the peripheral arterial disease and its effects after myocardial infarction in 28 771 patients undergone CAPRICORN, EPEHESUS, OPTIMAAL and VALIANT studies, the prevalence of peripheral arterial disease and the relation between PAD and cardiovascular diseases were analyzed in patients with left ventricle systolic dysfunction and heart failure after acute MI [13]. As a result, it was found that peripheral artery disease was an independent predictor for all fatal and nonfatal cardiovascular events, with the exception of a stroke.

It was proved that PAD is an independent predictor of a worse functional state in patients with MI due to deepening of structural and functional chan-

ges in the heart, deterioration of central and peripheral hemodynamics parameters due to structural changes in the heart and peripheral vessels, metabolic-functional disorders in internal organs accompanied by more frequent development of complications of a myocardial infarction. These patients are an important group for the individual rehabilitation regime, which requires careful control of arterial hypertension and intracardiac hemodynamics.

The obtained data on the high contingency between myocardial infarction, its complications and vascular pathology of peripheral localization testify to their close or common pathogenetic mechanisms of development and progression, as well as the need to consider the presence of comorbid peripheral vascular pathology in patients with MI when prescribing such patients an individualized rehabilitation program. The comorbidity index in this case reflects the degree of systemic changes, therefore,

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can act as an integral indicator that significantly affects the functional state of the body, and therefore can be used to predict the tolerance (adequacy) of rehabilitation measures in such comorbid patients.

Conclusions. 1. Association of myocardial infarction with comorbid peripheral arterial disease is an independent predictor of a worse functional state of the body in such patients, often leads to complications of MI, increases mortality, and therefore requires an individual regimen of rehabilitation measures.

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Prospects for further research. The study of markers prognosis for reduced exercise tolerance in patients with myocardial infarction with comorbid pathology and modification of rehab programs, depending on the type and degree of comorbidity is promising.

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ФУНКЦІОНАЛЬНА ХАРАКТЕРИСТИКА ХВОРИХ НА ІНФАРКТ МІОКАРДА ІЗ СУПУТНИМИ ЗАХВОРЮВАННЯМИ ПЕРИФЕРІЙНИХ АРТЕРІЙ ТА ОСОБЛИВОСТІ ПІДХОДІВ ДО ЇХ ВІДНОВНОГО ЛІКУВАННЯ

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РЕЗЮМЕ. Висока поширеність кардіологічних захворювань і їх часте поєднання з різними коморбідними станами спричиняють ріст кількості пацієнтів, у яких лікувальні підходи виходять за межі загальноприйнятих стандартів. Поширеність захворювань периферійних артерій (ЗПА) зростає у всьому світі, причому пацієнти із ЗПА мають не тільки знижену якість життя, але й високий ризик таких серцево-судинних подій, як інсульт, інфаркт міокарда і смерть внаслідок серцево-судинних захворювань.

Мета – аналіз взаємозв'язків між наявністю коморбідної патології периферійних артерій і функціональними показниками хворих на інфаркт міокарда.

Матеріал і методи. Обстежено 371 хворого на гострий інфаркт міокарда з коморбідною патологією, в тому числі ЗПА, які проходили гостру фазу реабілітації. Вік пацієнтів становив (66,16±10,41) року. Серед обстежених було 249 (67,12 %) чоловіків і 122 жінки (32,88 %). Параметри внутрішньосерцевої гемодинаміки визначали, оцінюючи ехокардіоскопічні показники, виміряні на апараті Philips HD11XE, електрокардіографічні показники серцевої діяльності вивчали за допомогою ЕКГ апарата «ЮТАС», біохімічні показники крові визначали загальноприйнятими методами, використовуючи стандартні тестові системи (Пліва-Лахема, Чехія).

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Результати. При вивченні зв'язків між супутньою патологією периферійних артерій у хворих на ІМ і числовими функціональними показниками було зафіксовано пряму кореляцію між наявністю судинної патології та тривалістю анамнезу артеріальної гіпертензії, величиною систолічного та діастолічного артеріального тиску, товщиною стінок лівого шлуночка та розміром правого шлуночка, а також між наявністю судинної патології і індексом коморбідності. Доведено, що ЗПА є незалежним предиктором гіршого функціонального стану в пацієнтів із ІМ внаслідок поглиблення структурно-функціональних змін серця.

Висновки. Асоціація інфаркту міокарда з коморбідним захворюванням периферійних артерій є незалежним предиктором гіршого функціонального стану організму. Індекс коморбідності Чарльсона може слугувати інструментом кількісної оцінки ступеня коморбідності у хворих на ІМ із ЗПА при визначенні функціонального статусу та плануванні реабілітації.

КЛЮЧОВІ СЛОВА: інфаркт міокарда; коморбідне захворювання периферійних судин; кардіореабілітація; індекс коморбідності Чарльсона.

ФУНКЦИОНАЛЬНЫЕ ХАРАКТЕРИСТИКИ БОЛЬНЫХ ИНФАРКТОМ МИОКАРДА С СОПУТСТВУЮЩИМИ ЗАБОЛЕВАНИЯМИ ПЕРИФЕРИЧЕСКИХ АРТЕРИЙ И ОСОБЕННОСТИ ПОДХОДОВ К ИХ ВОССТАНОВИТЕЛЬНОМУ ЛЕЧЕНИЮ

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РЕЗЮМЕ. Высокая распространенность кардиологических заболеваний и их частое сочетание с различными коморбидными состояниями вызывают рост количества пациентов, у которых лечебные подходы выходят за рамки общепринятых стандартов. Распространенность заболеваний периферических артерий (ЗПА) растет во всем мире, причем пациенты с ЗПА имеют не только сниженное качество жизни, но и высокий риск таких сердечно-сосудистых событий, как инсульт, инфаркт миокарда и смерть вследствие сердечно-сосудистых заболеваний.

Цель – анализ взаимосвязей между наличием коморбидной патологии периферических артерий и функциональными показателями больных инфарктом миокарда.

Материал и методы. Обследовано 371 больного с острым инфарктом миокарда с коморбидной патологией, в том числе ЗПА, которые проходили острую фазу реабилитации. Возраст пациентов составлял (66,16±10,41) года. Среди обследованных было 249 (67,12 %) мужчин и 122 женщины (32,88 %). Параметры внутрисердечной гемодинамики определяли, оценивая эхокардиоскопические показатели, измеренные на аппарате Philips HD11XE, электрокардиографические показатели сердечной деятельности изучали с помощью ЭКГ аппарата «ЮТАС», биохимические показатели крови определяли общепринятыми методами, используя стандартные тестовые системы (Плива-Лахема, Чехия).

Результаты. При изучении связей между сопутствующей патологией периферических артерий у больных ИМ и числовыми функциональными показателями было зафиксировано прямую корреляцию между наличием сосудистой патологии и продолжительностью анамнеза артериальной гипертензии, величиной систолического и диастолического артериального давления, толщиной стенок левого желудочка и размером правого желудочка, а также между наличием сосудистой патологии и индексом коморбидности. Доказано, что ЗПА является независимым предиктором худшего функционального состояния у пациентов с ИМ вследствие углубления структурно-функциональных изменений сердца.

Выводы. Ассоциация инфаркта миокарда с коморбидным заболеванием периферических артерий является независимым предиктором худшего функционального состояния организма. Индекс коморбидности Чарльсона может служить инструментом количественной оценки степени коморбидности у больных ИМ с ЗПА при определении функционального статуса и планировании реабилитации.

КЛЮЧЕВЫЕ СЛОВА: инфаркт миокарда; коморбидное заболевание периферических сосудов; кардиореабілітація; индекс коморбідності Чарльсона.

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