HEMODYNAMIC PARAMETERS OF MYOCARDIAL INFARCTION ON THE FIRST DAY OF THE DISEASE IN A COMORBID STATE

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ABSTRACT

Until today, diastolic dysfunction is one of the most understudied problems in modern medicine, although the prevalence is up to 50% among the population. The development of pathology occurs before the development of the appearance of the clinic and symptoms, as well as therapeutic effects on the mechanisms, which complicates the study, due to insufficient information [1]. Numerous studies [2] argue that the following risk factors predominate for the development of intact heart failure against the background of ischemic heart disease, such as female sex, the presence of concomitant pathology in the form of diabetes mellitus, obesity, arterial hypertension, metabolic syndrome, etc.

Keywords: Hemodynamic parameters, myocardial infarction, disease, comorbid state.

INTRODUCTIONS

According to the National Recommendations for the Diagnosis and Treatment of CHF, the main factors in the development of CHF are arterial hypertension (AH) - 88% and ischemic heart disease (IHD) - 59% of cases [7]. In recent years, chronic heart failure with preserved ejection fraction (CHF-SPF) is common, which requires a deep study of the functional state of the myocardium.

There are studies in which it is said that the clinic of heart failure in patients with normal LVEF is associated with impaired left ventricular diastolic function [4]. In the publication of materials by Zile M.R. et al. [3, 5] say that patients with clinical signs of heart failure and normal left ventricular ejection fraction underwent cardiac catheterization to determine the diastolic function of the left ventricle. As it turned out, patients with HF and normal left ventricular ejection fraction, when compared with patients in the control group, showed changes in the parameters of active LV relaxation and left ventricular stiffness. Research by Zile M.R. et al. [5] found that the pathophysiology of heart failure in patients with normal left ventricular ejection fraction is diastolic dysfunction.

Echocardiography is considered an important informational technique for determining the risk and prognosis after acute myocardial infarction. Conventional echocardiography provides information on parameters such as LV volumes and ejection fraction, wall motion index, left atrial volume, and the presence of mitral regurgitation. New prognostic data are provided by the development of tissue Doppler sonography and “speckle tracking” methods, such as deformity, strain rate and dyssynchrony of the left ventricle. Contrast echocardiography can assess myocardial perfusion and the integrity of the microvascular supply, which provides information about myocardial viability. Stress echocardiography allows to determine myocardial ischemia and viability, Doppler sonography of coronary arteries - to assess the reserve of coronary blood flow, and three-dimensional echocardiography indicates the volume, function and sphericity of the left ventricle [6].

One of the latest methods of transthoracic echocardiography (ECHOKG) makes it possible to determine the systolic and diastolic function of both the left and right ventricles in the diagnosis of CHF-SPV. EF is one of the main parameters determining LV contractility. LVEF is determined by a modified Simpson method showing LV architectonics [8]. Conventional echocardiography does not provide reliable information about the work of the

heart. Because of this, new methods are being developed that determine the state of the heart muscle by determining the ultrasonic strain (strain or strain) and the strain rate (strain rate) of the myocardium [9].

HF are classified according to the ejection fraction (EF) of the left ventricle (LV) [9, 10]. There is HF with normal LV EF (EF ≥ 50%; HF with preserved EF) and HF with reduced LV EF (EF <40%). Also in this classification there is an intermediate ejection fraction, the so-called "gray zone" in which LVEF is 49–40% [3,9].

The restrictive type of LV filling in patients with AMI is a powerful independent predictor of late LV dilatation and cardiovascular mortality [10]. Nijland F, et al. [11] states that a shortening of the early filling deceleration time (peak E) is a potent predictor for cardiovascular mortality in AMI patients. The survival time within a year in patients without a restrictive filling type (the ratio of the peak early diastolic filling rate (E) and the peak late filling rate (A) was ≤1 or between 1 and 2, and the deceleration time> 140 ms) was 100%. The groups with restrictive filling (E / A ratio ≥2 or between 1 and 2, and deceleration time ≤140 ms) was 50%. Also, mortality within 3 days was 100% and 22%, respectively. In addition, it has been proven that patients with a restrictive filling type after AMI have a high risk of CHF. In studies by Poulsen SH, et al. [12] during follow-up for a year after AMI revealed CHF in 71% of hospitalized patients with a restrictive filling type, while in 21% of patients the progression of CHF became a factor for re-hospitalization. Cerisano G, et al. [13] studied 104 patients with AMI by determining LV diastolic function by Doppler method. When observing for 32 months patients with a restrictive type of LV filling after AMI, the survival rate was 79% (deceleration time ≤130 ms), in patients without restrictive type 97% (deceleration time> 130 ms; p = 0.003). In a meta-analysis of 12 prospective studies of 3396 patients with myocardial infarction, restrictive type of LV filling was the main predictor of survival after AMI than LVEF [14, 15]. Currently, the prognostic value of LV strain (strain), reflecting the change in the length of the studied LV segment, as well as the strain rate, reflecting the time during which deformation of this segment occurs, is being studied in patients with AMI. Speckle tracking uses natural acoustic markers, or spots, that are visualized in the myocardium on standard ultrasound images of the heart. The speckle tracking technique makes it possible to distinguish between active and passive myocardial contraction. The “speckle tracking” technique was compared with the use of microcrystals and magnetic resonance imaging (MRI) of the heart [15,16]. The functional regenerative capacity of the myocardium and the outcome of the disease depend on the extent of myocardial necrosis in MI. Techniques such as delayed contrast MRI are used to determine the extent of myocardial necrosis. In studies by Vartdal T, et al. [14,17] found that the parameters of myocardial deformation determine the final size of myocardial infarction, which can determine the risk of complications in the acute stage of myocardial infarction. The researchers followed 30 patients with acute anterior myocardial infarction, establishing longitudinal deformity with TDG 1.5 hours after revascularization. At 9-month follow-up, multivariate analysis showed that global peak LV deformity was independently associated with MI size as measured by MRI. In a study by Zhang Y, et al. [18,19] examined 47 patients with primary AMI and 60 healthy people from the control group. After myocardial infarction several times all patients with myocardial infarction underwent TDG with calculation of strain rate and contrast MRI to establish its depth. The peak systolic rate of deformity of segments with transmural infarction was significantly lower than in segments with normal myocardium or non-transmural infarction. This study found that peak strain rate can aid in the differentiation of transmural and nontransmural MI and allows for the non-invasive determination of post-MI scar tissue. There is a direct relationship between traditional prognostic indicators and survival, as the deformity and deformation rate of the LV mainly serve as only indirect indicators of clinical outcomes [9,15].

The aim of the study was to study left ventricular diastolic dysfunction in patients with myocardial infarction on the first day of the disease according to echocardiography.

We studied 140 patients with acute myocardial infarction, observed by the cardiology department of cardiac intensive care, 1 and 2 therapeutic departments of the Samarkand branch of the Republican Scientific Center for Emergency Medical Aid (SFRNTSEMP) for 2018-2021.

Of the 140 patients with MI, there were 106 men and 34 women aged 34 to 84 years. The average age in the group was 57.4 + 10.8 years.

The observed patients had a large-focal MI, as well as transmural-53.7% (75). Anterior myocardial infarction was identified in 29.3% (41), posterior or inferior in 31.4% (44), lateral in 4.2% (6), and circular in 6.42% (9) patients. Clinically anginal (88.9%) prevailed, abdominal (4.2%) and other forms of MI (6.9%) were less common. In 111 (79.2%) patients, myocardial infarction was primary, and in 29 (20.7%) patients it was repeated.

Myocardial infarction was the first manifestation of coronary artery disease in 39 (27.85%) patients, in 101 (72.1%) patients with coronary artery disease with a prescription of 7.0 ± 6.3 years. Exercise angina was present in 72 (51.4%) patients. Anamnesis revealed various rhythm disturbances in 30 (21.4%).

The control group consisted of 20 practically healthy subjects of the same age (13 men and 7 women) in whom echocardiography did not reveal pathological changes in the heart.

The analysis of the clinical course of the disease revealed frequent heart rhythm disturbances, which were identified in 83 (59.28%) patients. Ventricular premature beats accounted for 69.8% (58) of rhythm disturbances. In 34 patients, ventricular extrasystole of I degree was established, in 17 - II, in 5 - III, in 2 - IV and in 0 - ventricular fibrillation (V grade). Atrial fibrillation was observed in 9 (10.84%) patients.

Conduction abnormalities were detected in 16 (19.2%) patients, of whom 6 developed 1st degree AV block, 3 - complete left bundle branch block, 7 - incomplete bundle branch block.The clinical characteristics of patients with MI depending on the type of LV DD are shown in Table 1.

Table 1

Clinical characteristics of patients with MI depending on the type of LV DD on days 1-3 of MI.

Parameters		**Type of LV diastolic dysfunction**		**Undefined type DF, # 46**
		Restrictive, No. 22	**Relaxation disorder, No. 72**	
Age (M±SD)		52,8±13,2	60,1±9,9	55,8±11,4
Sex	man	17(77,2%)	56(77,7%)	33(71,7%)
	women	5(22,7%)	16(22,2%)	13(28,2%)
Anamnesis	AG	13(59,09%)	45(62,2%)	27(58,7%)
	rhythm disturbances	10(45,4%)	10(13,8%)	9(19,5%)
Characteristics of IM	Primary	16(72,7%)	58(80,5%)	37(80,4%)
	Repeated	5 (22,2%)	15(20,8%)	9(19,56%)

	Front	8(36,6%)	21(29,2%)	12(26,08%)
	Rear; lower	7(31,8%)	23(31,9%)	14(30,4%)
Complications of MI	OCH I-IV class.	5(22,2%)	16(22,2%)	9(19,4%)
	CHF	12(54,5)	25(34,7%)	22(47,8)
	rhythm disturbances	14(63,.6%)	43(59,7%)	26(56,5%)
	LV aneurysm	10(45,4%)	9(12,5%)	11(23,9%)
Mortality		0	0	0

The restrictive type of LV filling during the acute period was mainly manifested in younger patients with anterior transmural MI complicated by an aneurysm of the LV apex and cardiac arrhythmias in the anamnesis. The development of CHF was manifested more often by LVDD of the restrictive type. At the same time, the effect on the character of LVDV in polypatients with AH, repeated MI and AHF, rhythm disturbances in the acute period has not been determined.

Clinical and anamnestic indices of patients with impaired LV relaxation and uncertain state did not differ significantly except for the average age, which was higher in the group of patients with LVDD. The similarity between the groups suggests that impaired LV relaxation is the initial stage of DD, and for a group with an indefinite type of DF, in some patients, normal DF remains due to intact parts of the myocardium.

Thus, with the restrictive type of DD in patients, it turned out to be more pronounced, when compared with other groups, dilatation of the left atrial and LV cavity, indicates a more pronounced structural and geometric reconstruction of the heart.

Indicators of LV wall thickness were observed mainly in groups with impaired relaxation than in groups with a restrictive type. In the absence of significant differences in the mass of the LV myocardium, this fact indicates that with a restrictive type of LV filling, the LV cavity may predominate over the wall thickness, while if relaxation is impaired, on the contrary, the LV wall thickness predominates over its cavity. In evidence, we can say that in patients with impaired LV relaxation, the indicators of end-diastolic size, EDV and ESR are less high and the values of EF are high.

table 2

Structural and functional indicators depending on the type of LV diastolic dysfunction on days 1-3 of MI

Parameters	Type of LV diastolic dysfunction		Undefined type DF, # 46
	Restrictive, No. 22	Relaxation disorder, No. 72	
LP (cm)	4,2±0,59	3,8±0,55	3,8±0,54
TMZhP (cm)	1,2±0,35	1,4±0,34	1,3±0,35
TZS (cm)	0,92±0,02	1,0±0,23	0,94±0,22
CDR (cm)	5,8±0,90	5,1±0,70	5,3±0,56
DAC (cm)	4,1±0,85	3,8±0,80	3,8±0,66
CDOI (ml / m2)	73,9±19,2	62,2±12,9	63,1±11,9
KSOI (ml / m2)	45,9±16,0	34,9±10,3	34,4±10,3
UI (ml / m)	29,8±8,78	28,1±6.0	30,3±6,4
PV (%)	37,7±8,7	43,9±6,7	43,3±6,3
MMI (g / m2)	94,8±15,5	93,7±13,5	92,6±14,9

LA - left atrium, TMZhP - interethral / ventricular septum thickness, TZS - posterior wall thickness, EDD - end-diastolic size, ESR - end-systolic size, EDV - indexed end-diastolic volume, CSOI - indexed end-systolic volume , MI - shock index, EF - ejection fraction, MMI - indexed myocardial mass.

Thus, the study made it possible to obtain additional data on the dynamics of LV diastolic function after MI. The role of LV diastolic dysfunction in the onset and development of CHF in patients with MI was assessed.

In connection with the above, it seems necessary to comprehensively assess the condition of patients, including the assessment of diastolic function, which will optimize treatment and prophylactic measures in MI.

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