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THE INFLUENCE OF ADHERENCE TO TREATMENT ON MYOCARDIAL DYSFUNCTION IN ELDERLY AND SENILE PATIENTS WITH ISCHEMIC HEART DISEASE AND HEART FAILURE

Abstract

The objective was to study the influence of adherence to treatment on myocardial dysfunction in elderly and senile patients with ischemic heart disease (IHD) and chronic heart failure (CHF). **Material and methods.** The study included 86 patients with ischemic heart disease (IHD) of older age groups admitted to the hospital due to the progression of CHF: 21 patients aged 65 to 74 years, and 65 patients aged 75 to 89 years. A standard clinical examination, echocardiography with global longitudinal strain assessment (GLS), and the Morisco-Green test were performed. **Results.** It was determined that in the group of senile aged patients there was a lower adherence to treatment and more pronounced structural and functional changes in the myocardium. The following correlations were revealed: total score of the Morisco-Green test with the left ventricular end-diastolic volume (r = -0.33, p <0.05), with E/e' (r = -0.37, p <0.05), and with GLS (r = 0.53). **The conclusion.** The findings indicate a lower adherence of the senile patients to treatment of IHD and CHF in comparison with the group of elder patients. Low adherence to therapy, as well as postinfarction cardiosclerosis, can apparently be considered as one of the factors contributing to the progression of myocardial dysfunction.

Key words: ischemic heart disease, heart failure, adherence to treatment, elderly and senile age, left ventricular dysfunction, echocardiography, global longitudinal strain of the myocardium

IHD — ischemic heart disease, WMSI — regional wall motion score index, GLS — global longitudinal strain, LV — left ventricle, PICS — postinfarction cardiosclerosis, LVEF — ejection fraction of the left ventricle, CHF — congestive heart failure, EchoCG — echocardiography

Introduction

Congestive heart failure (CHF) is one of the most common diseases and the leading cause of mortality in elderly and senile patients [3, 4]. In the recent years, emphasis has been placed on patient compliance with doctor's prescriptions which is essential for the successful treatment of chronic diseases [1, 10]. Compliance with a prescribed course of therapy is the degree to which a patient adheres (in terms of drug administration, changes in lifestyle and/or dieting) to the medical advice given by a healthcare professional [12]. The criterion of compliance is considered to be the administration of at least 80% of the prescribed doses [8]. In clinical practice, questionnaires are the most practicable

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method of assessing patient compliance [7, 11, 13]. A number of studies demonstrated reduced compliance in patients in the elderly age groups [2, 7, 8, 9]. Therefore, it is considered important to evaluate how the compliance of CHF patients influences the structural and functional changes in myocardium.

The objective of this study is evaluation of the influence of the adherence to medical advice on myocardial dysfunction in elderly and senile patients suffering from ischemic heart disease and congestive heart failure.

Materials and Methods

The study enrolled 86 elderly and senile patients with ischemic heart disease (IHD) who were admitted to a hospital due to the IHD progression. Mean age of the studied group was (83.2 ± 10.6) years (65 to 89 years), 53 females (61.7%) and 33 males (38.3%) were enrolled.

Only patients who signed the informed consent form according to the Order No. 390n of the Ministry of Healthcare and Social Development of the Russian Federation dated April 23, 2012 (registered by the Ministry of Justice of the Russian Federation on May 5, 2012, No. 24082) were examined. This study was approved by the Ethics Committee of the Federal State Budgetary Educational Institution of Higher Education North-East State

Medical University n. a. I. I. Mechnikov of Ministry of Healthcare of Russia.

According to the WHO definition, age of 65 to 74 years is considered elderly, age of 75 to 89 is considered senile. According to this classification, the patients were divided into two age groups: the first group included patients of 65 to 74 years (24.4%); the second group included those of 75 to 89 years (75.6%). Table 1 presents clinical features of the examined groups.

As the presented data show, 84.8% of the examined patients suffered from angina of 3 functional class, 62.7% had postinfarction cardiosclerosis (PICS) in medical history, 75 patients (87.2%) suffered from congestive heart failure of NYHA class 3. The most common concomitant disorders were hypertension (95.3%), type 2 diabetes mellitus (44.1%), renal disorders (26.7%), and chronic obstructive pulmonary diseases (45.3%). Multifocal atherosclerosis was detected in 52.3% of patients, and CVA was observed in the medical history of 31 patient (36%). Total duration of IHD history was (16.8 ± 14.69) years. Smoking as a risk factor was observed in the first group of patients (65 to 74 years). In the second age group, a large number of patients had myocardial infarction in the medical history. The percent of patients having a concomitant disorder and lesions of other vascular territories was higher. The main exclusion criteria were: episode of acute coronary syndrome within the previous month, severe global impairment of contractility (EF below

Table 1. *Clinical and anamnestic data of patients in age groups*

Parameters	Group 1 (65-74 y. o.), n= 21 (24.4 %)		Group 2 (75-89 y. o.), n= 65 (75.6 %)		Total (65-89 y. o.), n = 86	
Mean age	69,5±1,8		82,04±2,6		83,2±10,6	
Duration of IHD	11,4±1,6		17,6±2,8		16,8 ±14,69	
Angina pectoris III FC	14	66,7%	59	86%	73	84,8%
History of MI	7	33,3%	47	72,3%	54	62,7%
CHF III FC	14	66,7%	61	93,8%	75	87,2%
Hypertension	19	90,5%	63	96,9%	82	95,3%
Diabetes mellitus type 2	6	28,6%	32	49,2%	38	44,1%
COPD	10	47,6%	29	44,6%	39	45,3%
Kidney disorders	8	38,1%	15	23,1%	23	26,7%
History of acute cerebrovascular event	7	33,3%	24	36,9%	31	36,0%
Atherosclerosis, multiple localization	10	47,6%	35	53,8%	45	52,3%
Smoking	12	57,1%	10	15,4%	22	25,6%

35%), several episodes of myocardial infarction and coronary bypass surgery, complete left bundle branch block, and persistent atrial fibrillation.

According to the medical records, treatment for every patient was prescribed in compliance with the National Guidelines [3].

The patient examination included standard clinical workup (physical, laboratory, and electrocardiography examinations), echocardiography (EchoCG) including evaluation of tissue velocity imaging parameters, and the global longitudinal strain (GLS) of myocardium as well as validated Morisco-Green test.

The EchoCG examination was carried out following the current guidelines using Toshiba Artida ultrasonic system (Japan) and a 3.5 MHz transducer. The evaluation was focused on the LV myocardium wall thickness and local systolic function of the left ventricle (LV), and structural and functional status of the valvular apparatus. The ejection fraction of the left ventricle (LV EF) was calculated using the Simpson's method of discs. The local contractility was evaluated according to 16-segment model of LV recommended by ASE. In addition, the wall motion score index (WMSI) of LV myocardium was calculated. The LV diastolic function was evaluated based on the mitral flow propagation velocity determined in an apical four-chamber view obtained in pulsed wave Doppler mode as well as based on the tissue velocity imaging parameters such as early diastolic mitral annular velocity (e') and ratio of transmitral early filling velocity (E) to e' (E/e'). The global longitudinal strain (GLS) was evaluated using three apical views (2-chamber, 3-chamber and 4-chamber views) obtained by 2D-speckle-tracking method and calculation of mean value.

A validated Morisco-Green test [11] was used to evaluate adherence to the current treatment. The test consisted of four questions concerning the attitude of the patient to the drug administration. The test can be filled by the patients themselves. However, a doctor/relative can also read out the questions and tick the received answers. Answers to each question were "Yes" or "No", 0 points were assigned to "Yes" and 1 point was assigned to "No". Patients having greater adherence to treatment gained 3 or 4 points. Poorly adhering and non-adhering patients gained 2 points or less.

Statistical processing of the data was carried out using Statistica 8.0 for Windows software. Qualitative characteristics are expressed in absolute values and percents. Quantitative variables were presented as median, 25th and 75th percentiles, i.e. Me [25;75]. The Mann-Whitney U-test was used to evaluate statistical significance of differences among the groups of patients. The differences were considered significant at $p < 0.05$. The relation of the variables was studied on the basis of a correlation analysis and determining Spearman's rank correlation coefficient.

Results and Discussion

Eleven patients (12.8%) filled in the questionnaires themselves, and 70 patients (81.4%) filled in the questionnaires with the help of a doctor or a relative, whereas 5 patients from the second group did not answer the questions. There were no statistically significant differences in terms of anamnestic and clinical parameters observed between patients who filled in the questionnaires themselves and those who were helped. ($p > 0.05$). Table 2 presents the results of the tests in both groups.

Table 2. *Morisco-Green test results*

Parameter	Group 1 (65–74 y. o.), (n = 21)		Group 2 (75–89 y. o.), (n = 60)		p-value
	Total	%	Total	%	
Patients forgot to take the drug	5	23,8	39	65,0	< 0,05
Patients were neglectful to the time of the drug administration	2	9,5	27	45,0	< 0,05
Skipping administration if feeling well	1	4,8	31	51,7	< 0,05
Skipping administration if feeling unwell	4	19,0	20	33,3	< 0,05
Median (Me [25;75])	3,0 [2,5;3,5]		2,5 [2,0;3,0]		< 0,05

Table 3. Comparative evaluation of structural and hemodynamic parameters, obtained via two-dimensional echocardiography, in examined groups.

Parameter	Group 1 (65–74 y. o.), (n = 21)	Group 2 (75–89 y. o.), (n = 65)	ρ<
IVSd, mm	1.1 [0.9;1.6]	1.1 [0.8;4.3]	blank
PWd, mm	1.1 [0.9;1.3]	1.1 [1.0;1.3]	blank
LV EDD, mm	41.5 [40.1;45.9]	44.5 [42.3;49.4]	0.05
LV ESD, mm	28.0 [27;34]	29.0 [28;35]	blank
LV EDV, mm	88.5 [84.5;105.5]	111.0 [98;123]	0.05
LV ESV, mm	38.0 [36.4;45.2]	45.0 [42;56.2]	0.05
LAind, mm/m2	30.0 [29;32]	30.0 [29;34.5]	blank
LAVind, ml/m2	32.1 [31.0;33.2]	34.0 [32.4;35.3]	0.05
RWT	0.52 [0.51;0.54]	0.53 [0.52;0.54]	blank
LV MMI, g/m2	99.0 [96.3;116.4]	102.0 [110.4;118.1]	blank
EF, %	54.0 [51;63]	53.5 [50;62]	blank
WMSI	1.2 [1;1.3]	1.26 [1.2;1.8]	blank
GLS, %	-13.6 [-12.3;-15.1]	-11.6 [-9.4;-14]	0.05
E/A, RU	0.7 [0.6;0.8]	0.8 [0.7;1.02]	blank
e' lat. MVFR, cm/s	8.47 [7.5;9.3]	9.91 [8.3;10.4]	blank
E/e', per-unit value	7.0 [6.5;9.5]	8.3 [7.6;10.1]	blank
DT, mc	0.21 [0.20;0.24]	0.23 [0.21;0.24]	blank

Note: The data are presented in the form of Me [25; 75]. **IVSd** — The thickness of the interventricular septum in diastole; **PWd** — Thickness of the posterior wall in diastole; **LV EDD** — End-systolic size of the left ventricle; **LV EDV** — End-diastolic volume of the left ventricle; **LV ESV** — End-systolic volume of the left ventricle; **LAind** — The index of the left atrium, **LAVind** — The index of the volume of the left atrium; **RWT** — Relative wall thickness; **LV MMI** — Left ventricular myocardial mass index; **EF** — LV ejection fraction by Simpson method; **WMSI** — regional wall motion score index; **GLS** — global longitudinal strain; **E/A** — Ratio of peak diastolic velocities of mitral valve blood flow; **e' lat. MVFR** — Tissue early diastolic velocity of the lateral part of the MV fibrous ring; **E/e'** — The ratio of the early diastolic velocities of the MV blood flow and the motion of the lateral part of the MV fibrous ring; **DT** — Is the delay time of the early diastolic flow

Lower adherence to treatment was observed in the senile age group (75 to 89 years) (ρ < 0.05). Patients of this group were more likely to forget to take the drug, were more neglectful to the time of the drug administration, and were more likely not to take the dose when they felt well.

In both groups, males took drugs less regularly: 25% vs. 47.3% for females (ρ < 0.05).

The EchoCG examination showed signs of the cardiac diastolic dysfunction at normal mean values of the LV ejection fraction (Table 3).

At the same time, the values of the global longitudinal strain (GLS) describing the global longitudinal systolic function of LV were obviously lowered in the both groups.

A comparison of the EchoCG results of the two groups demonstrated significant differences of the LV EDD, LV EDV, LV ESV, LAVind, and GLS values. Generally, more apparent structural and functional changes of the myocardium were observed in patients from the second age group.

The analysis of correlation between the adherence to treatment and the parameters describing the myocardial dysfunction helped to reveal an inverse correlation between the total Morisco-Green score and LV EDV (r = –0.33; ρ < 0.05), between the total Morisco-Green score and E/*e'* parameter describing the diastolic function (r = –0.37; ρ < 0.05), as well as direct correlation between the total Morisco-Green score and the LV global longitudinal strain (r = 0.53).

Discussion

The results of the quantitative assessment of the adherence among the elderly age group patients suffering IHD and CHF based on the validated Morisco-Green test showed that the adherence to treatment in the elder group patients (65 to 74 years) is higher than in the group of senile patients. The obtained results evidencing the lower adherence to treatment of the senile patients are consistent with the literature [7].

Females followed the medical advice better in both age groups. According to the literature, females are more likely to adhere to treatment and to the medical advice than males [7].

Possible causes of the lower adherence can be conventionally divided into the main five groups [14]:

- Factors related to the patient (sex, age, education level, personal features).
- Factors related to the doctor (awareness on the disease and the treatment benefits, establishing or failure to establish confidential relations with the doctor, inadequate supervision and/or advice upon discharge).
- Social and economic factors (medication cost).
- Factors related to the medication features (efficiency, complexity of the dosage regimen, adverse events).
- Factors related to the disease (asymptomatic disease course, psycho-emotional state, presence of depression, cognitive impairment).

The results obtained in the study can evidence that one of the causes of the poor adherence to treatment in patients of the elderly age groups suffering IHD and CHF are memory impairment [4, 9]. Furthermore, the literature indicates that reasons of neglectful attitude to the time of the drug administration and the failure to take the dose when feeling well may include the poor awareness of the patient of the disease and the treatment methods, the importance of the current treatment, the cost of the prescribed medications if they are to be administered over a long period time, the complexity of the dosage regimen, and fear of the adverse events induced by the administered drugs [1, 2, 8].

On the one hand, more apparent impairment of the LV myocardium structure and function in patients of the senile age group (75 to 89 years) can be attributed to the higher occurrence of postinfarction cardiosclerosis [6]. On the other hand, lower adherence to treatment observed in this group can also have negative influence on the myocardial dysfunction. This can be proved by the correlation between the adherence level score (total Morisco-Green score) and EchoCG parameters. It should be noted that the correlation is demonstrated not only with the diastolic dysfunction parameter (E/e'), but with the LV global longitudinal strain, which is currently considered indicative of the LV systolic function [5].

Conclusion

The obtained data indicate the lower adherence of senile patients to a prescribed course of treatment for IHD and CHF when compared with elderly age patients. The poor adherence to treatment along with postinfarction cardiosclerosis apparently can be considered one of the factors promoting the progression of myocardial dysfunction.

Conflict of interest

The authors declare no conflict of interests.

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ИНФОРМАЦИОННОЕ ПИСЬМО

Главное военно-медицинское управление МО РФ;
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(ОДНОРАЗОВАЯ ДОЗА)

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В исследовании по проблеме оптимальной дозы кислорода при гипербарической оксигенации принимали участие 88 практически здоровых мужчин в возрасте 24-34 лет...

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