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FUNCTIONAL STATUS AND QUALITY OF LIFE DYNAMICS, HEART RHYTHM DISORDERS IN PATIENTS WITH CHRONIC HEART FAILURE DURING FUROSEMIDE AND TORASEMIDE THERAPY

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The article presents the results of the research conducted to study the characteristics of changes in functional status, quality of life, frequency of supraventricular and ventricular arrhythmias in patients with chronic heart failure of ischemic origin during diuretic therapy with furosemide and torasemide.

100 patients with chronic heart failure II-IV functional class were included in the research; all the patients were divided into 2 groups, each consisted of 50 patients, depending on the diuretic drug used (furosemide or torasemide). In the first group, treatment with furosemide was carried out, in the second group treatment was carried out with torasemide. The control group consisted of 21 with chronic heart failure. They had stable effort angina of exertion I–II functional class without signs of heart failure. The following research methods were used in the work: the clinical state assessment scale by V.Yu. Marev (V.Yu. Marev scale), The Minnesota Living with Heart Failure Questionnaire on the quality of life of patients with heart failure, the 6-minute walk test.

The results of the study showed that against the background of long-term treatment with diuretics, a significant improvement in the clinical condition was observed according to the clinical condition assessment scale from 8,5 to 13,7 scores with furosemide therapy and from 7,1 to 12,1 with torasemide therapy, $p < 0,01$, which is accompanied by a decrease in functional class of chronic heart failure in both groups according to the test results with a 6-minute walk test. When assessing the quality of life, its improvement was observed, which was reflected in the decrease in the number of scores from 71,6 to 46,4 with furosemide and from 69,7 to 40,5 with torasemide.

Key words: *chronic heart failure, loop diuretics, furosemide, torasemide, quality of life, functional status, cardiac arrhythmias, supraventricular arrhythmias, ventricular arrhythmias, long-term results.*

Chronic heart failure (CHF) is one of the most common and adverse complications of diseases of the cardiovascular system. One of the main clinical manifestations of heart failure is fluid retention in the body, manifested by edema syndrome. Dehydration therapy is one of the important components of the successful treatment of patients with heart failure [10]. Loop diuretics with powerful diuretic activity, including furosemide and torasemide, remain the drugs of choice for the treatment of this disease [8, 9]. Torasemide, in comparison with furosemide, has a high bioavailability, a longer biological half-life and has a stable diuretic effect. These properties determine its increased effectiveness in patients with heart failure, which has been demonstrated in a number of controlled clinical trials [1, 4, 5].

As it is known, the study of the quality of life is an important component of modern research in clinical practice and is an important criterion for the effectiveness of treatment. According to some authors [7], diuretics do not improve the patients' life expectancy and do not slow down the development of heart failure. Their effect on the quality of life can be negative if the treatment is wrong. However, a number of large studies (TORNADO, TORIC, PEACH), as well as an open study by M. Murray (2001), revealed significant advantages of torasemide over furosemide in terms of improving the quality of life, reducing the number of hospitalizations for heart failure decompensation [2, 3, 6, 11].

The purpose of the research was a comparative study of the features of changes in the functional status of heart failure, quality of life, frequency of supraventricular and ventricular arrhythmias in patients with chronic heart failure of ischemic origin during diuretic therapy with furosemide and torasemide.

Material and methods of the research. Research work carried out at the Scientific Research Institute of Cardiology named after J. Abdullayev, The Ministry of Healthcare of Azerbaijan Republic. 100 patients with CHF II-IV functional class (FC) were included in the research; all the patients were divided into 2 groups, each consisted of 50 patients, depending on the diuretic drug used (furosemide or torasemide). In the first group, treatment with furosemide was carried out, in the second group treatment was carried out with

torasemide. During the entire observation period, patients in the 2 groups were comparable in the treatment received, therefore this factor did not affect the results of this study. 69 people were men (average age 57,1 ± 2,1) and 41 people were women (average age 61,7 ± 2,5). The main nosological forms in patients were coronary heart disease, stable effort angina, post-infarction cardiosclerosis. Clinical and demographic characteristics of patients are presented in table 1.

Table 1

Clinical and demographic characteristics of patients

Indicator	Furosemide group	Torasemide group	Statistical reliability
The number of patients, people	50	50	
The average dose of diuretic, mg	64,1 ± 1,2	19,5 ± 0,9	p < 0,001
Demographic indicators			
Men / women, number	31/19	28/22	p > 0,05
Average age, years	58,7 ± 1,1	55,1 ± 2,2	p > 0,05
Clinical indicators			
6-minute walk test, m	201,1 ± 75,4	225,4 ± 69,7	p > 0,05
FC CHF (NYHA)			
I FC, number of patients (%)	0	0	
II FC, number of patients (%)	6 (12 %)	6 (12 %)	p > 0,05
III FC, number of patients (%)	29 (58 %)	31 (62 %)	p > 0,05
IV FC, number of patients (%)	15 (30 %)	13 (26 %)	p > 0,05
Coronary Heart Disease, number of patients (%)	43 (86 %)	40 (80 %)	p > 0,05
Myocardial infarction, number of patients (%)	26 (52 %)	27 (54 %)	p > 0,05
Hypertonic disease, number of patients (%)	47 (94 %)	48 (96 %)	p > 0,05
Clinical state assessment scale, score	8,5 ± 1,2	7,1 ± 1,7	p > 0,05
Quality of Life (Minnesota Questionnaire), score	71,6 ± 7,5	69,7 ± 5,9	p > 0,05

As it can be seen from this table, there was no statistically significant difference between the groups according to the main demographic indicators and clinical characteristics before treatment. The greatest number of patients belonged to FC III CHF.

The initial dose of the drug was selected individually based on the FC of heart failure and edema syndrome. For patients with FC II CHF, the doses of furosemide and torasemide were 20 and 5 mg, respectively, for patients with FC III-IV CHF, the doses of furosemide and torasemide were 40 and 10 mg, respectively. A further dose of the drug was adjusted depending on the reaction to diuretics. With an insufficient response to the diuretic, every 3 days after the start of treatment, the dose of the diuretic gradually increased to 120 mg for furosemide and 40 mg for torasemide. Thus, the average dose was 64,1 ± 1,2 mg for furosemide and 19,5 ± 0,9 mg for torasemide.

The control group consisted of 21 with CHF. They had stable effort angina of exertion I-II FC without signs of heart failure. They also received treatment with these diuretics. The control group by age and sex corresponded to the main groups (treatment with furosemide, treatment with torasemide).

Patients with acute coronary syndrome, myocardial infarction, prolonged ventricular extrasystoles of high gradations according to Lown-Wolf-Ryan, atrioventricular blocks, atrial fibrillation, sick sinus syndrome, and severe chronic pulmonary disease with symptoms of respiratory failure were excluded from the study.

Patients' quality of life was studied before treatment, 3 and 6 months after treatment, based on the Minnesota Living with Heart Failure Questionnaire (MLHFQ) on the quality of life (QoL).

The FC CHF was determined on the basis of the scale for assessment of clinical stateby V.Yu. Mareev: I FC CHF – up to 3 scores; II FC – 4–6 scores; III FC – 7–9 scores; IV FC – more than 9 scores. Terminal heart failure – 19 scores; the absence of chronic heart failure symptoms – 0 score.

MLHFQ QoL consists of 21 questions and allows to determine the effectiveness of the therapy. The maximum score (105) of the questionnaire corresponded to the worst indicator, 0 score – to the best indicator.

All digital indicators were processed using statistical analysis methods. For a sample of n < 30, the distribution-free Wilcoxon-Mann-Whitney test was used. The correlation coefficient r was also calculated. All calculations were carried out in an Excel spreadsheet.

The research results and discussion. ***The dynamics of the functional status and quality of life in patients with chronic heart failure during treatment with furosemide and torasemide.*** As it was mentioned above, the study included 100 patients with CHF II-IV FC, which were divided into 2 groups of 50 patients each, depending on the diuretic drug used (furosemide or torasemide). During the entire observation period, patients in the 2 groups were comparable in the treatment received, therefore this factor did not affect the results of this study.

The dynamics of the functional status of patients was assessed by changes in FC CHF over the observation period. The results of the 6-minute walk test are presented in table 2.

Table 2

The dynamics of the FC CHF according to the test results with a 6-minute walk before and after treatment with furosemide and torasemide

FC CHF	Furosemide(n = 50)		Torasemide (n = 50)	
	Before treatment	After treatment	Before treatment	After treatment
II	6 (12 %)	18 (36 %)	6 (12 %)	21 (42 %)
III	29 (58 %)	25 (50 %)	31 (62 %)	23 (46 %)
IV	15 (30 %)	7 (14 %)	13 (26 %)	6 (12 %)

Initially, patients with II-IV FC CHF were included in the study. During the observation period, significant changes to this parameter occurred. As can be seen from this table, the therapeutic effect of the use of two loop diuretics for 6 months of treatment did not differ significantly. When the test was repeated with a 6-minute walk 6 months after treatment, an increase of the functional capacity was noted, which was accompanied by a decrease in FC CHF in both groups.

If before treatment in 6 (12 %) patients from both groups II FC CHF was noted, then 6 months after diuretic therapy, their number increased, respectively, to 18 (36 %) and 21 (42 %) people due to transformation from III and IV FC. At the same time, the number of patients with IV FC CHF significantly decreased from 15 (30 %) to 7 (14 %) in the furosemide group and from 13 (26 %) to 6 (12 %) in the torasemide group. At the same time, the number of patients with III FC decreased from 29 (58 %) to 25 (50 %) in the first and from 31 (62 %) to 23 (46 %) in the second group. Moreover, both before and after treatment, a significant part of the patients were patients with III FC.

Similar developments in the FC of heart failure occurred during re-evaluation of the patients' clinical condition after treatment with diuretics based on the Clinical state assessment scale (Table 3).

Table 3

The **dynamics of the functional class of heart failure on the scale for assessing the clinical state before and after treatment with furosemide and torasemide**

Indicator	Furosemide (n = 50)		Torasemide (n = 50)	
	Before treatment	After treatment	Before treatment	After treatment
Clinical state assessment scale	8,5 ± 1,2	13,7 ± 1,1**	7,1 ± 1,7	12,1 ± 1,3**
II	9 (18 %)	15 (30 %)	8 (16 %)	16 (32 %)
III	27 (54 %)	29 (58 %)	30 (60 %)	29 (58 %)
IV	14 (28 %)	6 (12 %)	12 (24 %)	5 (10 %)

*Note: statistical difference with indicators before treatment: ** – p < 0,01*

As it can be seen from the table, against the background of prolonged treatment with drugs, a significant improvement in the clinical condition was observed from 8,5 to 13,7 scores with furosemide therapy and from 7,1 to 12,1 scores with torasemide, p < 0,01. The described dynamics was accompanied by an improvement FC CHF. Treatment with diuretics led to an increase in the number of patients with II FC CHF: from 9 (18 %) to 15 (30 %) people in the furosemide group and from 8 (16 %) to 16 (32 %) in the torasemide group. This transformation was accompanied by a decrease in the number of patients with IV FC – from 14 (28 %) to 6 (12 %) in the furosemide group and from 12 (24 %) to 5 (10 %) in the torasemide group. A significant part of patients both before and after treatment with drugs was made up of patients with III FC CHF. During treatment with furosemide, their number increased from 27 (54 %) to 29 (58 %) people, mainly due to the transformation from IV FC. Treatment with torasemide led to a slight decrease in the number of individuals with III FC CHF: from 30 (60 %) to 29 (58 %) people.

The results of the quality of life according to the Minnesota Questionnaire showed that with prolonged treatment with diuretics, improvement in QoL was observed. This was reflected in a decrease in the number of scores from 71,6 to 46,4 with furosemide and from 69,7 to 40,5 with torasemide. At the same time, a significant improvement in QoL occurred mainly due to decreasing of water retention of calves, feet; decreased mobility during walk or climbing stairs, a feeling of lack of air, a feeling of anxiety, and due to an increase in the opportunities of meaningful physical recreation. QoL during treatment with these drugs worsened, mainly due to a violation of full night's sleep and the inability of the long-distance travel.

Dynamics of supraventricular and ventricular arrhythmias in patients with chronic heart failure during treatment with furosemide and torasemide. The dynamics of supraventricular cardiac arrhythmias in patients with heart failure during treatment with furosemide and torasemide based on the results of Holter ECG monitoring are shown in table 4. As it can be seen from this table, the most common form of supraventricular arrhythmias was single supraventricular extrasystoles, which were equally common in patients from groups 1 and 2 and in frequency of occurrence, respectively, by 20,5 and 20,8 times, $p < 0,001$, exceeded the values of the control group.

Table 4

Dynamics of supraventricular arrhythmias before and after treatment with furosemide and torasemide

Indicator	Control group (n = 21)	Furosemide (n = 50)		Torasemide (n = 50)	
		Before treatment	After treatment	Before treatment	After treatment
Single supraventricular arrhythmias per day	96,7±2,1	1980,2±23,2***	2096,1±19,1***	2015,2±15,7***	511,7±10,1*^^^
Paired supraventricular arrhythmias, per day	2,3±0,2	150,6±1,2***	155,2±1,3***	171,6±2,1***	75,1±0,9**^^
Group supraventricular arrhythmias, per day	-	1,7±0,1	3,1±0,7^^	3,7±0,3	0,7±0,1^^
Supraventricular tachycardia, per day	-	0,2±0,01	0,8±0,02^^	0,3±0,02	0,4 ± 0,01

*Note: statistical reliability with a control group: * – $p < 0,05$; ** – $p < 0,01$; *** – $p < 0,001$; with indicators before treatment: ^ – $p_0 < 0,05$; ^^ – $p_0 < 0,01$; ^^^ – $p_0 < 0,001$*

However, there is a varied dynamics of supraventricular cardiac rate disturbance in the treatment with drugs. If against the background of treatment with furosemide, a misleading tendency was observed to increase the number of supraventricular extrasystoles by 5,5 %, then against the background of therapy with torasemide, a significant decrease in the number of this type of arrhythmias was observed by 3,9 times, $p < 0,001$. Therefore, the amount of extrasystoles after treatment with torasemide decreased by so much that it was only 5,3 times higher than their number compared with the control group.

The next most common form of supraventricular arrhythmia in patients with CHF was paired extrasystoles, which also tended to increase by 2,9 % in the treatment with furosemide and significantly decreased by 2,3 times, $p < 0,01$, in the treatment of torasemide. However, both before and after treatment with furosemide and torasemide, the number of paired supraventricular extrasystoles exceeded the values of the control group of individuals without heart failure by 65,5 times; 67,5 times; 74,6 times, $p < 0,001$, and 32,6 times, $p < 0,01$, respectively.

It should be noted that in the studied patients from the control group, in contrast to patients with CHF from groups 1 and 2, group supraventricular extrasystoles and supraventricular tachycardia did not occur. During treatment with furosemide, an increase in these varieties of arrhythmias was observed by 1,8 and 4,0 times, $p < 0,01$, respectively. The treatment with torasemide, on the contrary, was accompanied by a significant decrease in the number of group supraventricular arrhythmias by 5,3 times, $p < 0,01$, while the number of episodes of supraventricular tachycardia did not change significantly.

In the dynamics of ventricular cardiac rate disturbances in patients with heart failure during treatment with furosemide and torasemide, which is reflected in table 5, similar changes were observed. As can be seen from the table, initially in patients with heart failure in both the first and second groups, the number of single ventricular extrasystoles, respectively, by 18,2 and 28,7 times, $p < 0,001$, exceeded the values of the control group. During treatment with furosemide, the number of ventricular extrasystoles increased by 2,4 times, $p < 0,05$, and torasemide therapy, on the contrary, led to a significant decrease in the number of single

ventricular extrasystoles by 3,8 times, $p < 0,01$. As a result of the described changes after treatment with furosemide, the number of ventricular extrasystoles was by 43,6 times, $p < 0,001$, higher than the control group, and after treatment with torasemide this difference was only 7,5 times, $p < 0,001$.

Table 5

Dynamics of ventricular arrhythmias before and after treatment with furosemide and torasemide

Indicator	Control group (n = 21)	Furosemide (n = 50)		Torasemide (n = 50)	
		Before treatment	After treatment	Before treatment	After treatment
Single ventricular arrhythmias per day	28,5±1,1	518,2±13,5***	1243,1±11,1***^	817,1±10,3***	214,7±5,3***^^
Paired ventricular arrhythmias, per day	1,3±0,1	58,4±1,0***	98,2±1,2***^	93,5±1,3***	65,1 ± 0,5***^
Group ventricular arrhythmias, per day	-	0,7±0,1	2,1±0,7^	1,3±0,1	0,5 ± 0,1^
Ventricular tachycardia, per day	-	-	-	0,1±0,02	-

*Note: statistical reliability: with a control group: * – $p < 0,05$; ** – $p < 0,01$; *** – $p < 0,001$; with indicators before treatment: ^ – $p_0 < 0,05$; ^^ – $p_0 < 0,01$; ^^^ – $p_0 < 0,001$*

Similar developments during treatment with drugs occurred with the number of paired ventricular extrasystoles per day. Treatment with furosemide led to a significant increase in the amount of this type of extrasystole by 1,7 times, $p < 0,05$, and therapy with torasemide was accompanied by a decrease in their number by 1,4 times, $p < 0,05$. In this case, both before and after treatment with drugs in both the first and second groups, the number of paired ventricular arrhythmias remained, respectively, by 44,9, 75,5, 71,9 and 50,0 times higher than in the group control of persons without heart failure.

In the control group, there were no patients with group ventricular extrasystoles and ventricular tachycardia. The number of group ventricular extrasystoles during treatment with furosemide increased 3 times, $p < 0,05$, while therapy with torasemide led to a significant decrease in this type of arrhythmia by 2,6 times, $p < 0,05$. Such a dangerous and rare type of arrhythmia as ventricular tachycardia did not occur in patients of group 1 receiving treatment with furosemide. Only 1 patient from the second group experienced a short episode of ventricular tachycardia, which was no longer observed during the second examination after treatment with torasemide.

The data obtained in this study confirm that the drugs of the same class – furosemide and torasemide, being effective diuretics, have an uneven effect on the structure of supraventricular and ventricular cardiac arrhythmias. Unlike furosemide, torasemide therapy is accompanied by a decrease in the number of supraventricular and ventricular arrhythmias.

Conclusion. In this way, the results of the study showed that against the background of long-term treatment with diuretics, a significant improvement in the clinical condition was observed according to the clinical condition assessment scale from 8,5 to 13,7 scores with furosemide therapy and from 7,1 to 12,1 with torasemide therapy, $p < 0,01$, which is accompanied by a decrease in FC CHF in both groups according to the test results with a 6-minute walk test. When assessing the quality of life, its improvement was observed, which was reflected in the decrease in the number of scores from 71,6 to 46,4 with furosemide and from 69,7 to 40,5 with torasemide.

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ХИРУРГИЧЕСКОЕ ЛЕЧЕНИЕ ДИСКОГЕННОЙ КОМПРЕССИИ НЕРВНЫХ ЭЛЕМЕНТОВ ШЕЙНОГО ОТДЕЛА ПОЗВОНОЧНИКА

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Изложены результаты исследования, осуществленного с целью анализа клинических (неврологических) признаков больных, страдающих грыжами межпозвонковых дисков шейного отдела позвоночника. Кроме того, представлены условия выбора хирургической тактики и сравнительный анализ полученных итогов. Проведен ретроспективный анализ 91 истории болезни пациентов, прооперированных в Учебно-хирургической Клинике Азербайджанского медицинского университета и в «Униклинике» с диагнозом грыжи межпозвонкового диска шейного отдела позвоночника различной этиологии. Из них 78 пациентов были прооперированы с применением современных имплантов, в то время как в 13 случаях оперативного вмешательства подобные импланты не использованы. Доказано, что применение имплантов улучшает клинический (неврологический) статус прооперированных больных, так как в группе таких пациентов была достигнута полная декомпрессия и стабилизация позвоночника. В отдаленном послеоперационном периоде у них наблюдалось полное восстановление утраченных функций.