

CHARACTERISTICS OF HEART FUNCTIONAL DISORDERS IN GOUT DISEASE

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ANNOTATION

In our study, 88 patients (all male) were selected to examine the structural and functional status of the myocardium in patients with gout. EchoCG screening was performed in patients with gout (recurrent and chronic).

ECG and EchoCG examinations revealed changes in the cardiovascular system in 82% of patients. Moreover, while LV hypertrophy was detected in 43% of patients, the presence of AH was noted in 62% of these patients. At the same time, an average of 70% of patients with EchoCG were diagnosed with the following types of valvular lesions: IVB thickening - 50% of cases, LV posterior wall thickening - 44%, LA hypertrophy - 36%, LVDD - 31.5%. Various disturbances in heart rhythm and conduction have also been reported, with a predominance of ventricular extra systoles. At the same time, the above changes have been found to be more common in chronic forms of the disease. By the way, in this study it was found that the development of cardiopathy is directly related to the concentration of uric acid, xanthine oxidase in the blood.

Keywords: gout, transmetral flow, left ventricular architectonics, arterial hypertension, coronary heart disease, cardiovascular disease, myocardial infarction.

RELEVANCE OF THE TOPIC

The relevance of the study of gout disease is also explained by the fact that its incidence as a medical and social problem is increasing from year to year and people's ability to work is declining. According to various authors, gout affects 1% of the male population in European countries. The disease is one of the leading causes of arthritis in middle-aged men. Despite the fact that the methods of diagnosis and treatment are improving day by day, the incidence of gout has increased dramatically in the last 30 years. Another reason for the growing interest in the study of gout is also explained by the fact that the disease is closely associated with disorders of metabolic processes in the body. According to the World Health Organization (2000), gout is associated with obesity, hypertension, type 2 diabetes, and metabolic syndrome. This suggests that the increased risk of cardiovascular damage in gout is high. In particular, according to M.S. Eliseev and others, 65% of patients with gout die from cardiovascular complications. In this case, atherosclerotic changes on the basis of cardiovascular complications play a key role. Taking into these circumstances account, it can be said that the combined development of cardiovascular damage, metabolic syndrome, and gout leads to premature disability in a particular patient and early death due to various complications. The high incidence of cardiovascular lesions in patients with gout indicates the importance of a comprehensive study of the disease.

The Objective of the Research

To improve the early detection and management of manageable risk factors in patients with gout and to improve the treatment of the disease.

The Materials and Methods of Examination

In this department, 88 patients with gout (all men) were selected for examination. Depending on the course of the disease, patients were divided into recurrent and chronic types. All patients underwent echocardiography (EchoCG).

The mean age of the patients was 56.6 ± 8.5 (from 42 to 72 years). Patients under 44 years of age accounted for 7.9%, those aged 45 to 59 years for 50.0%, and those aged 60 to 72 years for 42.1%.

At the onset of the disease, the mean age of the patients was 43.5 ± 8.3 . The disease began between the ages of 35-53 in most patients (73.7%). The youngest patient with the disease was 29 years old, and the oldest patient with the onset of the disease was 61 years old.

The average duration of the disease was 10.0 (6.0; 16.5) years, ranging from 2 months to 39 years.

All patients were divided into 2 groups: group 1 with 30 patients with recurrent disease and group 2 with 58 patients with chronic disease. The mean age of patients in group 2 was greater than that of patients in the first group (57.3 ± 8.9 and 55.8 ± 8.2 years, $r < 0.05$ correlation). The anamnesis of patients with chronic gout was longer than that of patients with recurrent disease (13.0 [7.0; 15.0] and 12.0 [3.0; 25.0] age, $r < 0.05$ correlation). Patients in the second group reported higher BMI than in the first group (31.92 [28.9; 34.67] and 31.76 [25.01; 42.52] kg / m², $r < 0.05$ correlation). Despite the course of the disease, high levels of uric acid were found in both groups of patients. The content of uric acid in the blood plasma was 599.0 (357.0; 970.0) $\mu\text{mol/l}$ in patients with recurrent gout, while in patients with chronic disease was 536.5 [473.5; 602.0] $\mu\text{mol/l}$. In comparison, there was a difference between the two groups of patients ($r < 0.01$).

RECEIVED RESULTS

A study of the cardiohemodynamics of patients with gout revealed a number of changes.

In patients with chronic gout, left ventricular end-diastolic dimension (LVEDD) and end-diastolic volume (LVEDV) were found to be 4.65% and 10.3% higher, respectively, than in patients with recurrent gout. Left ventricular end-systolic dimension (LVESD) and left ventricular end-systolic volume (LVESV) were found to increase by 2.4% and 5.45%, respectively, in patients with chronic gout ($r < 0.05$).

In the control groups, the thickness of the interventricular septum (IVS) was almost the same (Table 1) ($r < 0.05$). Left ventricular posterior wall thickness was 1.65% higher in patients with chronic disease than in the first group. In view of this, a number of indicators were found to be higher in patients with chronic disease (Table 2). When calculating the left ventricular relative wall thickness (LVRWT), the difference between patients in the first and second groups was 106.8%, as described above.

Left ventricular myocardial mass was observed to increase in one direction only in parallel with the severity of gout. There was a significant difference ($r < 0.05$) between the study groups. In

patients with chronic gout, LVMM was 103.7% ($r < 0.05$) compared with patients with recurrent disease. In the control groups, LVMMI was almost equal in both groups (Table 1) ($r < 0.05$).

Table 1 Cardiohemodynamic parameters in patients with gout

Indications	The course of the disease	
	Recurrent (n=30)	Chronic (n=58)
LVEDD, cm	5,16 [4,80; 6,20]	5,40 [5,10; 5,70]
LVEDV, ml	128,07 [107,52; 193,99]	141,31 [123,81; 160,04]
LVESD, cm	3,37 [3,00; 3,70]	3,45 [3,10; 3,65]
LVESV, ml	46,61 [35,00; 58,13]	49,15 [37,92; 56,32]
IVS thickness, cm	1,21 [0,9; 1,44]	1,2* [1,08; 1,28]
LVWT, cm	1,22 [1,05; 1,48]	1,24* [1,06; 1,33]
LVRWT	0,47 [0,40; 0,56]	0,44* [0,41; 0,47]
LVMM, g	258,77 [187,2; 441,05]	268,32* [226,41; 336,86]
LVMMI, g/m ²	131,56 [94,14; 220,53]	131,40 [109,86; 165,19]

Note: * - $r < 0.05$ Difference between group 1 and 2 patients.

Transmetral blood flow was studied in all patients using EchoCG. Each patient had the following transmetric current values (E is the maximum early diastolic opening A is the maximum early systolic opening):

- normal type: E/A = 1.0-2.0; LV IRT = 50-100 ms; LV SFP > 170 ms.
- hypertrophic type: E / A < 1.0; LV IRT > 100 ms; LV SFP < 170 ms.
- pseudonormal type: E / A = 1.0-2.0; LV IRT < 50 ms; LV SFP > 170 ms.
- decompensated type: E / A > 2.0; LV IRT < 50 ms; LV SFP < 170 ms.

(LV IRT- left ventricle isovolemic relaxation time

LV SFP- left ventricular slow filling period)

Among the patients in our studies, only 2 types of transmetal flow disorders were identified: normal and hypertrophied types. Transmetric flow rates of patients are shown in Table 2.

Table 2 Transmetral flow rates in patients with gout

Indicators	Normal type of transmetric flow (n = 60)	Hypertrophic transmetal current (n = 28)
E, m/s	112,96 [105,0; 120,0]	85,75 [80,0; 95,0]*
A, m/s	86,2 [71,0; 100,0]	100,4 [100,0; 101,0]*
E/A	1,36 [1,14; 1,54]	0,85 [0,79; 0,95]*
LV IRT, ms	61,5 [55,2; 79,5]	123,5 [99,5; 147,3]*
LV SFP, ms	173,0 [151,5; 190,3]	138,5 [99,5; 150,2]

Note: * - $r < 0.001$ the difference unit of patients in the first and second group.

In a study of left ventricular diastolic dysfunction (LVDD) in patients with gout, abnormalities were reported in 26.6% of patients with recurrent disease and in 37.9% of patients with chronic disease (Table 3).

Table 3 Frequency of LVDD in patients with gout, n (%)

Indications	The course of the gout		R
	Recurrent (n=30)	Chronic (n=58)	
LVDD (exist)	8 (26,6)	22 (37,9)	<0.01
LVDD (does not exist)	22 (73,3)	36 (62,07)	<0.01

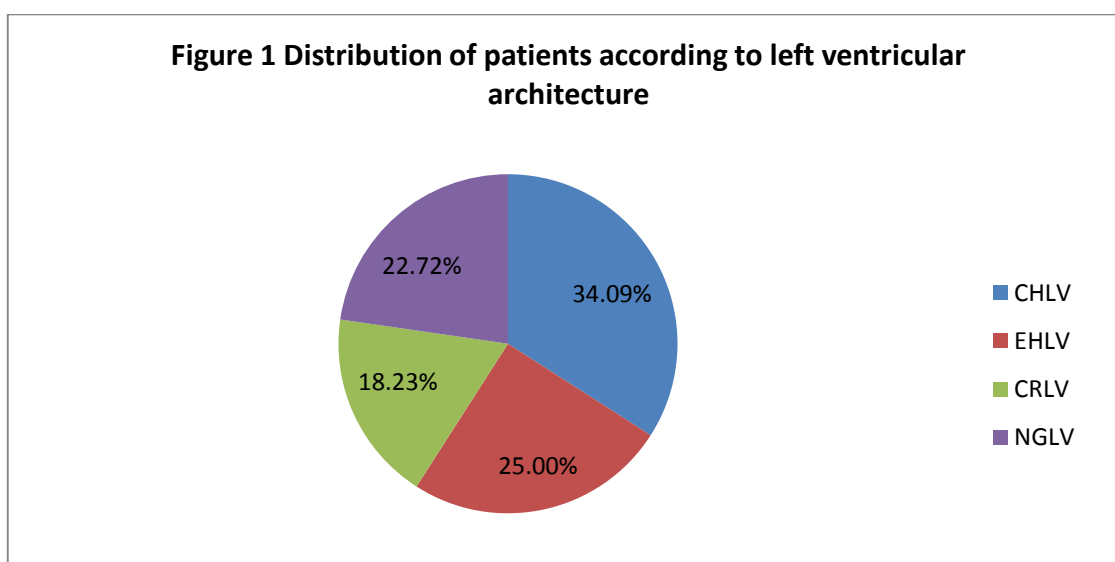
The results show that in patients with gout, structural changes in the left ventricle are more pronounced depending on the course of the disease. LVDD is observed in 34.09% of patients with primary gout, the incidence of which develops depending on the course of the underlying disease.

In this scientific study, we divided patients into groups according to the geometric structure of the left ventricle. Geometric models of 4 groups of left ventricle differ depending on LVMMI (left ventricular myocardial mass) and LVRWT (left ventricular relative wall thickness).

- LV with normal geometry (NGLV) - with normal LVMMI and normal LVRWT.
- concentrated remodeling LV (CRLV) - LVRWT increased, LVMMI is normal.
- concentrated hypertrophied LV (CHLV) - LVRWT increased, LVMMI also increased.
- eccentric hypertrophied LV (EHLV) - LVMMI increased, LVRWT decreased.

Among the patients examined, there were patients with all four types of left ventricular architecture: NGLV in 20 (22.72%) patients and CRLV in 16 (18.2%) patients; CHLV was detected in 30 (34.09%) patients and EHLV in 22 (25%) patients (Figure 1).

It was found that every 4th patient with gout does not have left ventricular architectonics, 1/3 of patients have CRLV, and 25% of patients have EHLV. In the remaining patients, CR was observed while LVMMI was maintained normally.



Depending on the severity of gout in patients, changes in the geometric structure of the left ventricle were also observed (Table 4).

Table 4 Frequency of occurrence of LV geometric shapes depending on the course of the disease in gout

Left ventricular geometric types	Disease course		R
	Recurrent (n = 30)	Chronic (n = 58)	
NGLV	4(13,4)	16 (27,58)	<0.05
CRLV	8 (26,6)	8(15,38)	<0.05
CHLV	12 (40)	18 (31,03)	<0.05
EHLV	6 (20)	16 (27,6)	<0.05

In patients with chronic gout, CHLV was observed in 31% of cases, EHLV in 27.6% of patients, CRLV in 15.4% of patients and NGLV in 27.58% of patients. In patients with recurrent disease, the most developed (40%) CHLV, and in 26.6% of cases CRLV occurred. In patients with recurrent disease, EHLV was observed in 20% and NGLV in 13.4%. In our study, the overall incidence of left ventricular failure was 61.5% in patients with recurrent disease and 56% in patients with chronic disease. In most cases, patients developed concentric left ventricular hypertrophy. It is known that these architectural disorders are among the unmodified risk factors of the cardiovascular system and are among the worst risk factors in the development of heart failure.

Table 5 Frequency of occurrence of LVDD in gout depending on the geometric shapes of LV

Indicators		NGLV (n=20)	CRLV (n=16)	CHLV (n=30)	EHLV (n=22)
LVDD	exist	6 (30,0)	12 (75)	6 (20,0)	6 (27.27)
	does not exist	14 (70)	4 (25%)	24(80,0)	16 (72.72)
R		<0.001	<0.01	<0.001	<0.001

There is no evidence in the literature that left ventricular diastolic filling has been studied in gout due to the geometric structure of the left ventricle, so we decided to perform this analysis. The results show that left ventricular diastolic dysfunction is most common in CHLV (Table 5).

Table 6 Frequency of occurrence of geometric types of LV in patients with AH with gout

Indicators		NGLV	CRLV	CHLV	EHLV
AH	exist (n=60)	8 (12.9)	12 (19.35)	22 (35.48)	18 (29.03)
	does not exist (n=28)	12 (46.15)	4 (15.38)	8 (30.77)	4 (15,38)
R		<0.01	<0.05	<0.01	<0.05

It was found that 36% of patients with gout with AH had CHLV, and 29.0% had EHLV. ABP was also reported to be normal in patients with NGLV. Interestingly, in 54.5% of patients, the architecture of the left ventricle was observed to be impaired even in the normal state of ABP. 88 patients with primary gout underwent echocardiography. The first group included 28 patients with normal ABP and the second group included 60 patients with AH. The mean age of the first group of patients was found to be lower than that of the second group of patients

(53.7 [51.1; 60.7] and 59.7 [49.8; 63.1], respectively, $r < 0.05$). In patients with and without AH, the content of uric acid in the blood plasma was almost equal (563.5 [339.0; 917.0] and 568.6 [361.0; 883.0] $\mu\text{mol} / \text{l}$, respectively, $r < 0.05$).

LV EDD and EDV were found to increase by 4.6% and 11.3%, respectively, in the second group of patients compared to the first group of patients (Table 7) ($r < 0.05$). LV ESD and ESV were found to increase by 2.4 and 6.6%, respectively, in the second group of patients ($r < 0.05$).

Table 7 Cardiohemodynamic parameters depending on the presence or absence of AG in gout

Indicators	Arterial hypertension	
	Does not exist (n=28)	Exist (n=60)
LV EDD, cm	5,18 [4.70; 5,50]	5,42 [4.90; 6,20]
LV EDV, ml	128,91* [102.36; 147,42]	143,53 [112.81; 193,99]
LV ESD, cm	3,36 [3.00; 3,60]	3,44* [3.00; 3,90]
LV ESV, ml	46,45 [35.00; 54,43]	49,51* [35.00; 65,91]
IVS thickness, sm	1,15* [0.92; 1,38]	1,20* [0.90; 1,42]
LVWT, sm	1,27 [1.05; 1,56]	1,38* [1.15; 1,59]
LVRWT	0,44 [0.35; 0,53]	0,45* [0.40; 0,51]
LVMM, g	238,56* [161.11; 312,94]	283,12 [182.18; 419,30]
LVMMI, g/m2	118,20 [83.40; 153,85]	142,09* [90.58; 218,33]

Note: * $r < 0.05$ Clear differences between the first and second groups.

IVS thickness was found to be 4.3% thicker in the second group of patients than in the first group. The differences between the two groups were obvious. Left ventricular posterior wall thickness was 8.7% higher in patients with AH than in the first group ($r < 0.05$). All of the indications were high in patients with AH. The relative thickness of the left ventricular wall was 102.3% in patients of group 2 ($r < 0.05$).

In patients with AH, LVMM is 1.2 times higher than in patients without the disease. LVMMI also showed higher rates in the second group of patients in line with LVMM (Table 7).

When we studied the rise in ABP in relation to the course of gout, we found that this figure was higher in patients with chronic disease. (Table 8).

Table 8 Frequency of AHs depending on the course of gout n (%)

Indicators		Patients with recurrent gout (n = 30)	Patients with chronic gout (n = 58)	R
AH	Exist	18 (60)	42 (72,4)	Nd
	Does not exist	12 (40)	16 (27,58)	Nd

We analyzed left ventricular diastolic dysfunction based on whether patients had AH or no (Table 9). Diastolic dysfunction of the LV was also observed in 28.57% of patients with normal blood pressure with gout. Diastolic dysfunction of LV is detected in more than 33% of patients with gout who have AH.

Table 9 Frequency of LVDD occurrence in the absence of AH, n (%)

Indicators		Arterial hypertension		P
		Does not exist (n=28)	Exist (n=60)	
LVDD	Exist	8 (28,57%)	20 (33.3%)	<0.01
	Does not exist	20 (71.42%)	40 (66.7)	<0.01

Based on the above results, it can be concluded that in patients with gout, changes in left ventricular architectonics and diastolic dysfunction are different, depending on the course of the disease, the geometric structure of the left ventricle and arterial hypertension.

CONCLUSION

In every fourth patient with gout, there is no violation of the architectonics of LV, CHLV is formed in almost a third of patients, EHLV is observed in 26.7% of cases, and in one-fifth of patients, changes in its cavity are observed while maintaining a normal index of LV myocardial mass (CRLV). The frequency of formation of different geometric models of LV varies depending on the course of gout (recurrent and chronic). LVDD occurs in 34.09% of patients with gout. The structural and functional changes of the myocardium in gout are different and depend on the clinical course of the disease, the type of LV geometry and the presence or absence of AG.

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