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Heart failure, atrial fibrillation: association of white blood cells count and Leukocyte indexes

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ABSTRACT

The aim of the study was to investigate the prospective association of WBC count and its individual components in patients with HF and sinus rhythm or and AF compare a population of apparently healthy middle-aged men and women. We observed of 389 patients with HF II-IV FC (NYHA): 357 patients with sinus rhythm and 32 patients with permanent HF, and 30 apparently healthy persons were included into this study. We studied of leukocytes count, their subpopulations in blood and some of leukocyte' indexes were calculated. The HF is characterized of increased WBC, lymphocyte and neutrophil counts. There are no difference in this parameters in patients with AF or with sinus rhythm.

Keywords: heart failure, white blood cells, atrial fibrillation

1. Introduction

There are many data that inflammatory processes are involved in the pathophysiology of heart failure (HF), and inflammation is currently discussed as a therapeutic target in heart failure. White blood cell (WBC) count is a marker of systemic inflammation, but data on the association with the risk of heart failure are sparse [1, 2].

Atrial fibrillation (AF) is the most common arrhythmia in HF; it increases the risk of thrombo-embolic complications (particularly stroke) and may lead to worsening of symptoms. Whether AF is an independent predictor of mortality is less certain, as is whether it can cause systolic HF ('tachy cardio myopathy') [3]. Well-known predictors of AF include age, hypertension, valvular disease, myocardial infarction, diabetes mellitus, and congestive heart failure. Less well-known risk factors for AF have increasingly been coming to attention, including sleep apnoea, alcohol or other intoxication abuse, excessive physical activity, latent hypertension (i.e. diastolic dysfunction), genetic factors, obesity or body mass index (BMI), and inflammation [4].

The aim of this study was to investigate the prospective association of WBC count and its individual components in patients with HF and sinus rhythm or and AF compare a population of apparently healthy middle-aged men and women.

2. Material and Methods

We observed of 389 patients with HF II-IV FC (NYHA). The diagnosis was verified by laboratory and instrumental methods according to European Society of Cardiology recommendations (2013, 2014). All patients were randomized into two groups: 357 patients with sinus rhythm and 32 patients with permanent HF. 30 apparently healthy persons were included into control group. We studied of leukocytes count and their subpopulations in blood. The following leukocyte' indexes were calculated: index of neutrophils to monocytes ratio (INMR), index of neutrophils to mononuclear cells ratio (IN/LM), index of neutrophils to lymphocytes ratio (INLR), index of lymphocytes to monocytes ratio (ILMR).

The study was performed in accordance with the Helsinki Declaration and Good Clinical Practice Guideline. The study was approved by the local ethics committee and written informed consent was obtained from all patients. Statistical analyses were performed using the Statistica 6.1 (Stat Soft, Tulsa, OK, USA). Statistical significance was assumed at p<0.05.

3. Results and Discussion

In cohort of observed patients with HF and sinus rhythm 79 (22, 18%) were females. The middle age was 67, 98±12, 06 years. 10 patients with HF were females (31, 25%). The middle age in this group was 70, 09±9, 91 years.

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II – nd FC of HF (NYHA) was verified in 63 patients with sinus rhythm (17,65%); III-rd – in 238 (66,67%); IV-th – in 56 (15,68%). 267 (74,78%) persons had history of myocardial Infarction (MI). Among them 27 patients (7, 56%) had history of recurrent MI.

In cohort patients with AF the II-nd FC was verified in one case; III-rd – in 20 cases (62, 5%); IV-th – in 11 cases (34, 38%).

Analysis of leukogram (see Table 1) showed a significant increase of WBC count, lymphocyte and neutrophil counts in both observed groups of patients with HF compare control group. We didn't found any difference between counts of investigated leukocytes (and its individual components) in both groups of patients with heart failure.

These changes were confirmed by changes in some leukocyte indices in groups of patients with HF (see Table 2). Thus, the parameters of INMR and ILMR were significant higher than in control. But no difference between observed patients with AF or with sinus rhythm was founded.

We founded the multiply linear regression link between age and WBC count in patients with HF and sinus rhythm (beta=0.95, p<0,001).

Although elevated WBC has consistently been an independent risk factor for future cardiovascular outcomes [5]. One population based study investigating the association between WBC and incidence of hospitalizations due to heart failure in men without prior history of MI, observed HR of 1.0, 1.26, 1.24 and 1.73 across quartiles of WBC [1]. Two other studies conducted in acute myocardial infarction patients with reduced ejection fraction reached similar conclusions. In the Studies of Left Ventricular Dysfunction (SOLVD) among CHD patients with reduced ejection fraction, a WBC count of > 7000/mm3 (compared with WBC ≤ 7000/mm3) was associated with a greater likelihood and increased severity of heart failure [6]. In a prospective analysis of the Thrombolysis in Myocardial Infarction (TIMI) trials, even after controlling for numerous confounders, the WBC count remained independently associated with the development of new heart failure in patients with acute myocardial infarction [7]. In the ARIC data, the increased risk for heart failure associated with increased WBC count was driven by granulocytes (neutrophils, basophils, eosinophils). Consistent with this findings, some previous studies have suggested that higher neutrophil or granulocyte counts may be stronger predictors of CHD than other WBC components [8].

The Framingham Heart Study showed an increased WBC count was associated with incident AF during 5 years of follow-up [9].

Table 1: The WBC count and its components in observed patients (M ±m)

Value, G\l	HF and sinus rhythm, n=357	HF and AF, n=32	Control, n=30
WBC	6,81±0,13**	6,85±0,31**	5,49±0,06
Lymphocytes	1,98±0,05**	1,85±0,11**	1,41±0,03
Monocytes	0,39±0,02	0,35±0,04	0,34±0,01
Neutrophils	4,23±0,09*	4,58±0,26***	3,65±0,05

Remarks: HF – heart failure; AF – atrial fibrillation; WBC – white blood cells; * - significance compare control p<0, 05; ** - significance compare control p<0, 01; *** - significance compare control p<0,001.

Table 2: The Leukocytes' Indexes in Patients with HF (M±m)

Value	HF and sinus rhythm, n=357	HF and AF, n=32	Control, n=30
INMR	14,60±0,50*	16,80±1,50**	11,44±0,41
ILMR	7,05±0,27**	7,84±1,08**	4,39±0,12
INLR	2,54±0,11	2,69±0,23	2,63±0,07
IN/LMR	1,95±0,05	2,19±0,16	2,14±0,06

Remarks: HF – heart failure; AF – atrial fibrillation; WBC – white blood cells; * - significance compare control p<0, 05; ** - significance compare control p<0, 01.

4. Conclusions
The HF is characterized of increased WBC, lymphocyte and neutrophil counts. There are no difference in this parameters in patients with AF or with sinus rhythm.

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