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## Basic laboratory tests in patients with arterial hypertension

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### Abstract:

The aim of the study was to assess the reactivity basic laboratory tests in patients with well-controlled arterial hypertension (AH). The analysis included 44 patients with well-controlled AH aged 23 to 74 years. Statistical analysis showed a significant effect of disease duration on the level of eGFR and NT-proBNP. The longer the disease duration, the lower the eGFR and the higher the NT-proBNP.

**Keywords:** arterial hypertension, laboratory tests, creatine, eGFR, NT-proBNP

### 1. Introduction

Arterial hypertension (AH) is a chronic disease of the circulatory system [1]. The pathophysiological mechanisms responsible for the development of AH are complex and overlap with the concomitant genetic predisposition [2]. Arterial pressure depends, among others, on sodium intake [3], the renin-angiotensin-aldosterone system [4], disorders of the immune system [5], and natriuretic peptides [6]. In monitoring patients with hypertension, it is also important to treat concomitant risk factors such as lipid disorders and hyperuricemia, as well as early detection of the presence of complications in the cardiovascular system [7]. Primary hypertension is a chronic disease and leads to the development of complications. There is structural and functional damage to the vessels or end organs, such as the heart, brain, eyes and kidneys. It is noted that damage can occur in both those with poor control of HT and those with better disease control.

Proper control of the blood pressure and general health of the patient can delay the onset and progression of organ damage and reduce global cardiovascular risk. For this purpose, regular physical examination and additional examinations are recommended in patients with hypertension [1].

## **2. Material and Methods**

### **2.1 Material**

The analysis included 44 patients with well-controlled AH, aged 23 to 74 years, and 22 subjectively healthy volunteers matched in terms of sex and age to the study group. During the study period, 41 patients in the study group were regularly taking drugs from various groups. Patients with diabetes mellitus, generalized atherosclerosis, infection, current neoplastic disease, G4 or G5 chronic renal failure, chronic heart failure and confirmed secondary hypertension were not included in the study.

### **2.2 Methods**

#### **2.2.1 Biochemical Analysis**

For laboratory tests, blood was collected from fasting subjects from the cephalic vein. The tests were performed at the Laboratory Diagnostics Department of the Independent Public Clinical Hospital No. 1 in Lublin. Peripheral blood counts were performed, including hemoglobin level (g / dl) norm M: 14-18 g / dl, K 12-16 g / dl, WBC (K / uL) norm 4-10 K / uL, PLT (K / uL) norm 130-400 K / uL, full lipid profile, including total cholesterol (mg / dl) norm 115-190 mg / dl, HDL (mg / dl) norm > 40 mg / dl, LDL (mg / dl) norm < 115 mg / dl, TG (mg / dl) norm < 150 mg / dl and other biochemical tests such as NT pro-BNP (pg / ml) norm 0-225 pg / ml, creatinine (mg / dl) norm 0.7- 1.2 mg / dl, eGFR (ml / min / 1.73m<sup>2</sup>) m<sup>2</sup>, fasting glucose (mg / dl) norm 70-99 mg / dl and CRP (mg / l) norm < 5 mg / l.

## **3. Statistical Analysis**

The obtained results were analyzed statistically. The values of the analyzed measurable parameters were presented by means of the mean value, median and standard deviation, and for non-measurable ones - by the number and percentage. For measurable features, the normal distribution of the analyzed parameters was assessed using the Shapiro-Wilk test. The Mann-Whitney U test was used to compare two independent groups. The Kruskal-Wallis test was used to compare the age of the groups. A significance level of  $p < 0.05$  was adopted, indicating the existence of statistically significant differences or relationships. The database and statistical research were carried out on the basis of the STATISTICA 13.0 computer software (StatSoft, Poland).

## **4. Results**

44 patients were included in the study. In the study group, women and men constituted the same percentage. The mean age in the study group was 54.02 years. In the study group, the patients were most often overweight (38.64%) or obese (36.36%). Most often, patients suffering from hypertension were treated for more than 5 years (43.18%).

Statistical analysis showed a significant effect of disease duration on the level of eGFR (R = -0.53) and NT-proBNP (R = 0.33). The longer the disease duration, the lower the eGFR and the higher the NT-proBNP. There was no significant effect of disease duration on other parameters ( $p > 0.05$ ) (Table 1).

Table 1. Assessment of the relationship of individual parameters in the study group with the duration of the disease

Parameters	Statistical analysis	
	R	p
Hemoglobin (g / dl)	-0.13	0.39
WBC (K/uL)	0.03	0.85
PLT (K/uL)	-0.26	0.09
Fasting glucose (mg / dL)	-0.16	0.31
Total Cholesterol (mg / dL)	-0.26	0.09
HDL cholesterol (mg / dl)	-0.28	0.07
LDL cholesterol (mg / dl)	-0.22	0.16
Triglycerides (mg / dl)	-0.02	0.87
CRP (mg/dl)	-0.02	0.90
Creatinine (mg / dl)	0.24	0.11
<b>eGFR (ml/min/1.73m<sup>2</sup>)</b>	<b>-0.53</b>	<b>0.0002*</b>
<b>NT-proBNP (pg/ml)</b>	<b>0.33</b>	<b>0.03*</b>

## 5. Discussion

AH is a persistent increase in blood pressure due to various factors. These factors disturb the physiological regulation of pressure. The action of RAAS, the sympathetic nervous system, natriuretic peptides and substances produced by the endothelium are closely related by feedback, which is disrupted in patients with hypertension, leading to a higher blood pressure. NT may be asymptomatic for many years. Patients may complain of headaches and easy fatigue. Other symptoms appear as organ complications develop. Monitoring by controlling blood pressure and early detection of complications in patients with hypertension is extremely important [8]. In the context of research on laboratory parameters, it is worth quoting the results concerning the relationship between the duration of HT and the level of eGFR and NT-proBNP, which parameters deteriorated with the passage of time from the diagnosis of HT. It is worth adding that AH is an important cause of chronic kidney disease. Identifying risk factors for progression to chronic kidney disease in patients with normal renal function and hypertension can help target therapies to slow or prevent worsening of kidney function.

A study by Hanratty et al. Showed that time-changing values of systolic blood pressure above about 120 mmHg were associated with a constant increase in the risk of developing chronic kidney disease [9]. It is worth adding here that thiazide and thiazide-type diuretics should not be used in patients with eGFR below 30 ml / min / 1.73 m<sup>2</sup> [7]. The level of NT-proBNP is a useful diagnostic and prognostic parameter in heart failure, which is a common complication of hypertensive heart damage mainly associated with remodeling of its walls. Natriuretic peptides also participate in disease compensation and inhibiting its progression [6]. Higher levels of NT-proBNP in the blood in the study group may indicate an excessive load on the walls of the heart, which in the future may lead to left ventricular hypertrophy and symptoms of heart failure. Left ventricular hypertrophy, together with the eGFR level, is one of the markers of organ damage in the course of AH [7]. It is worth adding that the proper functioning of natriuretic peptides prevents damage to microcirculation and improves glomerular filtration [6]. It should be added here that the use of antihypertensive drugs in the recommended combinations has a nephroprotective effect, reduces the number of cardiovascular events, improves the function of the vascular endothelium and reduces the number of inflammatory mediators. Modern antihypertensive treatment therefore has a beneficial pleiotropic effect on the entire body. Currently, it is recommended to use combination therapy from the very beginning in people with high cardiovascular risk [10].

## **6. Conclusions**

Basic biochemical tests such as NT-proBNP and kidney function deteriorate with the duration of arterial hypertension.

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