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CIRCADIAN RHYTHM BLOOD PRESSURE IN PATIENTS HEART FAILURE IN RENAL DYSFUNCTION

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Abstract:
Despite the frequent combination of chronic heart failure (CHF) with chronic kidney disease (CKD), the features of the circadian rhythm of blood pressure in patients with CHF associated with CKD remain insufficiently studied. 117 patients with CHF were examined.
In 56 patients, the glomerular filtration rate (GFR) was higher than 60 ml/min/1.73 m^2, a moderate decrease in GFR from 45 to 59 ml/min/1.73 m^2 was found in 37 patients, in 24 patients there was a pronounced decrease in GFR - below 45 ml/min/1.73m^2. The correlation of the degree of nocturnal decline was revealed SBP and DBP with GFR. Multivariate regression analysis confirmed an independent relationship between the decrease in GFR of less than 45 ml/min/1.73m^2 and the degree of nocturnal decrease in SBP and DBP. The results of the study indicate significant violations of the circadian rhythm of blood pressure in patients with CHF associated with CKD.

Keywords: chronic heart failure, chronic kidney disease, circadian rhythm AH.

INTRODUCTION.

Chronic heart failure is one of the most significant medical, economic and social problems of the XXI century. It is also one of the main causes of death in patients with cardiovascular diseases. The results of the "EPOCHA" study showed that arterial hypertension (AH) is the main cause of the development of chronic heart failure (CHF) in Russia and is diagnosed in 87.2 % of patients with CHF. In many patients, CHF is associated with chronic kidney disease (CKD). Even a moderate decrease in kidney function leads to an increased risk of cardiovascular complications. A decrease in glomerular filtration rate (GFR) below 60 ml/min/1.73m^2 is observed in 9.2–71.2% of patients with CHF. Insufficient awareness of practitioners about the frequency and clinical features of cardiorenal relationships in chronic heart failure leads to underdiagnosis of chronic kidney disease in this category of patients, which in turn has a negative impact on the quality of treatment and prognosis. Studies conducted in recent years have shown a great prognostic value of changes in the indicators of daily blood pressure monitoring for patients with cardiovascular diseases. Insufficient reduction of blood pressure at night negatively affects the function and morphology of target organs. Especially significantly increases the risk of cardiovascular events with insufficient nocturnal lowering of blood pressure in patients with impaired renal function. Patients with CKD are more likely to have systolic AH. The risk of developing nephropathy in patients with hypertension and the rate of progression of kidney damage in CKD
They are associated with the level of blood pressure (BP). Adequate antihypertensive therapy has a proven nephroprotective effect. Insufficient nocturnal decrease in blood pressure leads to an increase in the pressure load and contributes to the progression of damage to both the cardiovascular system and the kidneys. Currently, 24-hour ABP monitoring is widely used for the diagnosis and selection of drug therapy in patients with arterial hypertension. At the same time, the role of daily blood pressure monitoring has not been sufficiently studied in chronic heart failure, the prevalence of which is constantly increasing, and there is practically no data on the nature of the daily blood pressure profile in chronic heart failure associated with chronic kidney disease, which is about one-third of the total prevalence of CHF.

PURPOSE OF THE STUDY: To study the daily blood pressure profile in patients with CHF depending on the functional state of the kidneys.

MATERIALS AND METHODS. 117 patients with CHF (60 men and 57 women) were examined. The average age of the patients was 56.6±10.8 years. 15 patients were diagnosed with functional class I (FC), 73 – II and 29 – III FC CHF. The causes of CHF were: hypertension (GB) - in 38 patients, CHD– in 2, a combination of CHD and GB– in 77. The average values of systolic(SBP), diastolic(DBP) and pulse blood pressure, "pressure load" indices, blood pressure

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variability over the period of wakefulness and sleep, as well as the degree of nocturnal decrease in blood pressure were evaluated. The daily blood pressure profile was evaluated by the degree of nocturnal decrease in SBP and DBP using traditional criteria for determining the two-phase rhythm. The glomerular filtration rate was determined using the MDRD formula, and CKD was diagnosed according to NKF K/DOQI, Guidelines, 2002. The third stage of CKD was divided into 2 subgroups according to the NICE recommendations. Patients were divided into 3 groups depending on their functional state of the kidneys. In 56 patients, GFR was higher than 60 ml/min/1.73m^2 – group 1, a moderate decrease in GFR from 45 to 59 ml/min/1.73m^2 was found in 37 patients – group 2 of the subjects, 24 patients had a marked decrease in GFR-below 45 ml/min/1.73m^2- group 3. The results of the study were statistically processed using computer package Statistica V. 6,0: determined average values, standard deviation, significance of differences was determined depending on the type of distribution student's t-test or Mann-Whitney test for independent samples, $\chi 2$ (with Yates correction). Univariate correlation analysis and multivariate regression analysis were performed. The indicators are presented as M±SD. The difference was considered significant at $p<0.05$.

RESULTS AND DISCUSSION.

Decline GFR was associated with an increase in the age of patients with CHF. There were no gender differences between patients with CHF with preserved and reduced renal function, but there were more men in the second group than in the third. The values of office systolic and diastolic blood pressure in patients of all three groups did not differ significantly. When analyzing the indicators of 24-hour ABP monitoring between the groups of patients, there were no differences in the level of average daily SBP and pulse blood pressure, and the average daily indices of the time and area of hypertension of SBP. In the group of patients with CHF with a pronounced decrease in GFR, the average daily values of DBP were lower than in other groups, mainly due to daily indicators. With a decrease in GFR, there was a tendency to decrease the average daily values of SBP, DBP, and the "pressure load" indices of SBP and DBP, as well as an increase in pulse blood pressure. When analyzing the 24-hour ABP monitoring indicators separately during the day and at night It can be noted that the decrease in GFR was accompanied by a tendency to decrease the SBP in the daytime while increasing the SBP at night. Diastolic blood pressure with a decrease GFR tended to decrease both during the day and at night.

Systolic arterial hypertension was more frequently detected in all three groups. Stable systolic arterial hypertension (SBP time index>50%) was diagnosed in 53.3% of patients with CHF with GFR<60 ml/min/1.73m^2, 45% of patients with CHF with a moderate decrease in GFR and 53.8% of patients with CHF with a pronounced decrease in GFR ($p>0.05$).

Significant differences were found in the degree of nocturnal decrease in both systolic and diastolic blood pressure in patients with CHF with GFR<45ml/min/1.73m^2.

If at GFR>60 ml/min/1.73m^2, patients with a degree of nocturnal decrease in SBP≥10% were 50%, with a moderate decrease in GFR-47.5%, then at GFR<45 ml/min/1.73m^2 (group 3), they were only 19.2% (when comparing groups 1 and 3, $\chi^2=5.9$, $p=0.02$, when comparing groups 2 and 3, $\chi^2=4.3$, $p=0.04$). The daily profile of DBP in patients of group 3 also had significant differences: if at GFR>60 ml/min/1.73m^2, patients with a degree of nocturnal decrease in DBP≥10% (65% of patients) prevailed, with a moderate decrease in GFR of such patients was 60%, then with a pronounced decrease in GFR-38.5% (when comparing groups 1 and 3, $\chi^2=4.2$, $p=0.04$, when comparing groups 2 and 3, $\chi^2=2.1$, $p=0.1$). The degree of nocturnal decrease in SBP and DBP was correlated with GFR ($R=0.21$, $p=0.02$, and $R=0.23$, $p=0.009$, respectively), age of patients with CHF ($R=-0.35$, $p<0.001$, and $R=-0.28$, $p=0.002$, respectively), hemoglobin level ($R=0.21$, $p<0.05$, and $R=0.25$, $p=0.02$, respectively), and left ventricular myocardial mass index ($R=-0.24$, $p<0.05$ and $R=-0.29$, $p=0.02$, respectively).

It is known that in CKD, an increase in total and cardiovascular mortality is observed even with a moderate decrease in kidney function. Especially significantly increases the risk of cardiovascular events with GFR<45ml/min/1.73m^2. Thus, the number of hospitalizations for CHD, CHF, ischemic stroke and peripheral artery atherosclerosis in GFR is 45-59ml/min/1.73m^2 increase by 1.4 times, when 44-30 GFR ml/min/1.73m^2 – 2 times, with GFR 29-15 ml/min/1.73m^2 – 2.8 times, when GFR<15 ml/min/1.73m^2 – 3.4-fold.

In recent years, close attention has been drawn to the study of the features of the 24-hour ABP monitoring indicators in CKD. In patients with CKD, changes in the daily blood pressure profile were detected in the form of an insufficient (less than 10 %) degree of nocturnal decrease in blood pressure. This negatively affects the function and morphology of the target organs, and it was found that the relative wall thickness and left ventricular mass index of the left ventricular myocardium and the levels of atrial and brain natriureticpeptides in the serum increase, even with normal blood pressure in patients with circadian profile of blood pressure "non-dipper". On the other hand, the circadian rhythm of blood pressure in patients with CHF is an important predictor of the risk of death and hospitalization due to decompensation of CHF.

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The pathophysiological mechanisms and clinical significance of changes in the daily blood pressure profile remain unclear. The association of violations of the daily blood pressure profile with the age of patients, the presence of chronic kidney disease, diabetes mellitus, CHD, cerebrovascular pathology and CHF was established. The role of increasing the activity of the sympathetic nervous system and reducing vagal stimulation, reducing sodium excretion, reducing physical activity, increasing the use of table salt, and smoking is discussed.

The results of our study showed an independent relationship between the lack of proper reduction in blood pressure at night in patients with CHF and a decrease in GFR below 45ml/min/1.73m^2. It is known that age, low left ventricular ejection fraction, and diabetes mellitus are important predictors of impaired renal function. Thus, there is a coincidence of factors leading to the development of CKD and circadian rhythm disorders of blood pressure. At the same time, the blood pressure level remained unchanged. It can be assumed that the deterioration in the prognosis of patients with CHF is a consequence of kidney damage, and not an insufficient night-time decrease in blood pressure. The negative effect of reducing the degree of nocturnal blood pressure reduction on the prognosis of patients can be leveled by excluding patients with reduced renal function. Thus, J. Ishikawa et al. revealed an increase in the risk of developing cardiovascular events among elderly patients with arterial hypertension with the types of daily blood pressure profile "non-dipper" and "over-dipper". Randomization of patients with CKD led to a reduction in risk in the group of "non-dippers", while the degree of risk among "over-dippers" remained unchanged.

CONCLUSION.

The results of the study indicate significant violations of the circadian rhythm of blood pressure in patients with CHF associated with CKD. It remains unclear whether the detected violations of the daily blood pressure profile are compensatory or pathological in nature. Most drugs for the treatment of CHF have a pronounced antihypertensive effect and are able to change the circadian rhythm of blood pressure. To improve the effectiveness and validity of the choice of management tactics for patients with CHF, it is necessary to conduct further studies of the pathogenetic mechanisms and the prognostic value of changes in the 24-hour ABP monitoring indicators.

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