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CHANGES IN FUNCTIONAL RENAL RESERVE AS AN EARLY MARKER OF RENAL DYSFUNCTION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND ESSENTIAL HYPERTENSION

The aim of the study. To investigate changes in functional renal reserve (FRR) in patients with chronic obstructive pulmonary disease (COPD) stage II-III and essential hypertension (EH) stage II, to identify a correlation between the severity and stage of the underlying disease and the degree of reduced functional renal reserve (FRR).

Materials and methods. The study included 60 patients who were divided into 3 clinical groups: group 1-15 patients with stage II essential hypertension (mean age 52.87±1.36 years; male- to-female ratio 73.33/26.67%); group 2-15 patients with stage II-III COPD (mean age 48.01±2.75 years; male-to-female ratio 86.67/13.33%); group 3 - 30 comorbid patients with COPD stage II-III and essential hypertension stage II (mean age 57.49±2.39 years, male-to-female ratio 76.67/23.33%), without signs of other clinically significant comorbidities, who did not receive systematic basic antihypertensive therapy. All groups were statistically comparable in gender proportion and demographic characteristics.

After a comprehensive clinical, laboratory and instrumental examination, it was found that the patients did not have clinically significant renal pathologies of any etiology. The presence of early subclinical renal damage was assessed by determining the functional renal reserve (FRR), using glomerular filtration rate (GFR) by endogenous creatinine clearance before and 2 hours after oral protein loading. Patients from all three groups also performed renal blood flow assessment using spectral Doppler US with a convex multifrequency sensor. Blood flow in the renal arteries was studied at the level of the common trunk of the renal artery (CTRA), segmental (SRA) and interlobar branches of the renal arteries (ILRA) by

assessment of linear velocity parameters.

For a complex assessment of the blood pressure profile, patients were monitored for 24 hours with a CardioTens blood pressure monitor (ABPM), and the following indicators were evaluated: average values of systolic blood pressure (SBP), diastolic blood pressure (DBP), mean and pulse blood pressure (BP) per day (d), daytime (d) and nighttime (n) periods, variability of SBP and DBP; BP load was assessed by the time index (TIH) and the area index (AIH) of hypertension.

Results and conclusions. The data analysis showed that in patients with COPD and essential hypertension, the functional renal reserve was significantly lower by 3.79 times ($p<0.05$) compared with practically healthy individuals, while the basal glomerular filtration rate (GFR) in these groups did not differ significantly. It was found that comorbid patients with COPD and essential hypertension in almost 5/6 cases have signs of renal dysfunction in the form of impaired renal reserve capacity to proportionally increase GFR after protein loading, indicating the progression of hyperfiltration processes in the nephron. In summary, the calculation of functional renal reserve allows to identify and assess the presence of hyperfiltration as an early marker of nephropathy.

According to the Pearson agreement criterion, patients with COPD and essential hypertension with a serious decrease in functional renal reserve (FRR) were significantly more frequently diagnosed with adverse respiratory function (decrease in FEV1 index ($\chi^2=6.13$, $p=0.013$)), as well as cases of combination of microalbuminuria (MAU) with an increase in the resistance index at the level of the interlobular branches of the renal arteries (RI ILRA >1.05 conventional units ($\chi^2=13.64$, $p<0.001$)), which indicates a possible parallelism of certain pathological processes in the formation of glomerular filtration impairment and renal reserve capacity disorders in patients with COPD and essential hypertension.

It was found that in patients with essential hypertension and COPD, the progression of intraglomerular hypertension and hyperfiltration is associated with more severe clinical symptoms and the degree of blood pressure load according to the results of 24-hour ambulatory blood pressure monitoring, as evidenced by the presence of statistically significant correlations between the values of functional renal reserve, on the one hand, and of the CAT test and AIH of SBP daytime ($r =+0.55$ and -0.63 ($p<0.05$ for all cases)), on the other hand, which confirms the important relationship of intrarenal haemodynamic disorders with some prognostic factors in essential hypertension in combination with COPD.