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## Morpho-Functional Changes in the Left Ventricle in Patients With Chronic Heart Failure and Covid-19

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**Objective.** The primary aim of this study was to analyze echocardiographic parameters in patients who had suffered from COVID-19 and those who had not, and to assess the differences between their systolic and diastolic functions.

**Materials and Methods.** A total of 103 patients aged 60 years and older with chronic heart failure (CHF) were included in the study. The examinations were conducted at City Clinical Hospital No. 7 in Yunusobod District, Tashkent. Based on their history of COVID-19 infection, the patients were divided into two groups: Group 1 (n=52): CHF patients with a history of COVID-19. Group 2 (n=51): CHF patients who had not been infected with COVID-19. Echocardiographic (ECHO) parameters were analyzed in both groups to evaluate systolic and diastolic function. Statistical analysis was performed, with a significance level of  $p < 0.05$  considered statistically significant.

**Results.** Echocardiographic analysis was conducted to evaluate key parameters of systolic and diastolic dysfunction in the left ventricle. In almost all cases, notable changes were observed in the parameters describing left ventricular systolic function in both groups. In CHF patients with NYHA class II, the changes were mainly moderate, whereas in CHF patients with NYHA class III, the changes were significantly more pronounced, with substantial deviations from normal values. However, group 1 (COVID-19 patients) demonstrated a more pronounced deterioration in echocardiographic parameters compared to group 2. In both groups, patients with CHF NYHA class II had a left ventricular ejection fraction (LVEF) of  $54.6 \pm 4.2\%$  and  $56 \pm 6.1\%$ , respectively, indicating that LVEF remained above 50%. This suggests that significant negative changes in left ventricular systolic function were not observed in this subgroup. However, in CHF NYHA class III patients who had experienced COVID-19 (group 1), severe changes in systolic function were recorded. In this group, LVEF was  $48.7 \pm 5.8\%$ , which was 12% lower than in CHF NYHA class II patients ( $p < 0.001$ ). Additionally, in this group, total diastolic volume (TDV) increased by 24.4% ( $p < 0.0001$ ), and total systolic volume (TSV) increased by 38% ( $p < 0.0001$ ). Similar dynamic changes were also noted in group 2 (non-COVID-19 patients) when comparing CHF NYHA class II and III, but the severity of these changes was lower than in group 1. The prevalence of diastolic dysfunction was similar in both groups, with rates of 22% and 26%, respectively. In group 1, diastolic function parameters did not show significant differences between CHF functional

classes. However, when comparing CHF NYHA class III patients in groups 1 and 2, a statistically significant difference in the E/A ratio was found ( $p < 0.0001$ ). In COVID-19 survivors (group 1, NYHA class III CHF patients), the **E/A ratio** was 11.2% higher than in non-COVID-19 patients with the same CHF severity.

**Conclusion.** The results of this study indicate that significant changes in systolic and diastolic function were observed in both groups. However, in patients with CHF NYHA class III who had a history of COVID-19 (group 1), the alterations in left ventricular function were significantly more pronounced. Left ventricular systolic dysfunction was more evident in **COVID-19 survivors**, with reduced ejection fraction (LVEF) and increased ventricular volumes. Diastolic dysfunction was present in both groups, but COVID-19 survivors exhibited a higher E/A ratio, suggesting more severe diastolic impairment. Overall, the findings suggest that COVID-19 has a substantial impact on cardiac function, particularly in patients with pre-existing CHF. These results highlight the need for closer monitoring and early intervention in CHF patients who have recovered from COVID-19, as they may be at increased risk for worsening heart failure and adverse cardiovascular events.