

One-year cardiac follow-up of COVID-19 pneumonia: dynamics of right heart echocardiographic parameters three months and one year after discharge

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Funding Acknowledgements: Type of funding sources: None.

Background: COVID-19 affects firstly the respiratory system, however the cardiovascular system is also damaged. To study the long-term effect of COVID-19 pneumonia on cardiovascular system, in particular on echocardiography (EchoCG) parameters of right heart is important for patients rehabilitation.

Purpose: To compare EchoCG parameters of right heart in patients with proven COVID-19 pneumonia 3 months and one year after discharge.

Methods: A total of 116 patients with confirmed COVID-19 pneumonia were included from April 2020 to July 2021. All patients underwent clinical examination including transthoracic EchoCG 3 months \pm 2 weeks and one year \pm 3 weeks after discharge. Mean age of patients was 49.0 ± 14.4 years (19-84 years), females were 49.6%. During hospitalization, chest computed tomography (CT) detected mild lesions in 31.3%, moderate lesions in 33.3%, severe lesions in 29.3% and critical lesions in 6.1%.

Results: The rate of resolution of lung abnormalities according to CT was 55.9%. Mean body mass index was 28.7 ± 5.8 kg/m² 3 months after discharge, and it significantly increased to one year after discharge – 29.4 ± 6.1 kg/m² ($p < 0.001$). The mean anteroposterior right ventricular (RV) diameter index decreased over the observation period (13.5 ± 1.9 vs 13.0 ± 1.5 mm/m², $p < 0.001$), as well as the indices of end-diastolic and end-systolic RV area (8.0 ± 1.8 vs 7.5 ± 1.5 cm²/m² and 3.8 ± 1.1 vs 3.3 ± 0.8 cm²/m², respectively, both $p < 0.001$). The basal RV diameter increased (30.4 ± 5.4 versus 31.1 ± 4.1 mm, $p = 0.045$), the mid-cavitary RV diameter did not change (25.8 ± 5.4 and 25.8 ± 4.2 mm, $p = 0.852$), and the base to apex RV length decreased (69.5 ± 8.8 vs 63.9 ± 8.3 mm, $p < 0.001$). Basal and mid RV sphericity indices (RVSI) increased (0.44 ± 0.07 vs 0.49 ± 0.07 and 0.37 ± 0.07 vs 0.41 ± 0.07 , respectively, both $p < 0.001$). The systolic excursion of the fibrous ring of the tricuspid valve (TAPSE) (22.7 ± 3.2 and 22.8 ± 2.3 mm, $p = 0.637$) and the tricuspid annular peak systolic velocity S" did not change significantly (10.4 ± 2.6 and 10.1 ± 3.0 cm/s, $p = 0.289$). The fraction of change in the RV area (FAC RV) increased (52.6 ± 8.2 vs $55.0 \pm 8.9\%$, $p = 0.019$). The right ventricular outflow tract velocity time integral (RVOT VTI) decreased (18.1 ± 4.0 vs 16.4 ± 3.7 cm, $p < 0.001$). There were tendencies to increase in the systolic pulmonary artery pressure (PAPs) (22.5 ± 7.1 and 23.3 ± 6.3 mm Hg, $p = 0.076$) and to increase of the right atrium (RA) long axis dimension (48.7 ± 6.5 vs 49.5 ± 6.3 mm, $p = 0.074$).

Conclusions: Compared to three months after discharge, in patients one year after COVID-19 pneumonia EchoCG showed the anteroposterior RV diameter and the end-diastolic RV area decreased, the FAC RV increased. However, increase of the basal and mid RVSI, decrease in the RVOT VTI and tendencies to increase of the PAPs and the RA long axis dimension was observed. A subgroup analysis is planned depending on the severity of lung damage during hospitalization.