**TITLE: Echocardiography follow-up 1 year after ICU admission for COVID-19: Impact of highest level of respiratory support. Focus on the right heart.**

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**Introduction:** Right ventricular (RV) dysfunction (‘acute cor pulmonale’) is a common finding in patients with severe COVID-19. This study investigates the prolonged impact of COVID-19, in patients requiring admission to the Intensive Care Unit (ICU), on the right heart.

**Methods:** This is a single center, prospective observational study. We enrolled adult ICU-patients with COVID-19 infection between March 2020 and June 2021. Echocardiography with special focus on the right heart was performed one year after ICU discharge. Patients were stratified by their requirements for Invasive Mechanical Ventilation (IMV) and compared using Wilcoxon Rank Sums, Chi Square or Fisher’s Exact tests.

**Results:** A total of 70 patients were included, 40 of whom received IMV. Patients requiring IMV had a higher Sequential Organ Failure Assessment (SOFA) score (med: 8, IQR: [5-10] *vs* med: 3 IQR: [3-4]; p<0,01) and ICU length of stay (16 [9-35] *vs* 5 [3-8]; p<0,01). Echocardiography at one year showed a normal RV systolic function with tricuspid annular plane systolic excursion (TAPSE) of 23 [21-27] mm, RV systolic excursion velocity (S’) of 13 [11-15] cm/s, RV fractional area change (FAC) of 40 [31-46] % and RV global longitudinal strain (GLS) of -22 [-24 - -17]%. There were neither arguments for RV dilatation nor for pulmonary hypertension with respectively a RV end diastolic diameter (RVEDD) of 34 [30-38] mm and tricuspid regurgitation pressure gradient (TRPG) of 25 [19-34] mmHg. Overall, there were no significant difference in RV parameters between patients with or without IMV. Regarding the left ventricle (LV), the ratio of mitral E-wave to A-wave (E/A) was lower in the IMV group (0,8 [0,6-0,9] *vs* 0,9 [0,8-1,3]; p=0,02), which may suggest more impaired relaxation. Compatible with this finding, the left ventricular posterior wall was thicker in the IMV group (11 [9-12] *vs* 10 [8-11] mm; p=0,02). This may have been driven by a trend towards a higher percentage of arterial hypertension in the IMV group.

**Conclusions:** While many patients with severe COVID-19 infection develop important RV dysfunction during their ICU stay, we could not identify any echocardiographic sequelae one year after ICU discharge, not even in the severely ill subpopulation requiring IMV. This suggests that acute COVID-19-associated RV dysfunction is largely reversible.

**ADDENDUM: Reference Values:**

* Tricuspid annular plane systolic excursion (TAPSE): > 16 mm
* RV systolic excursion velocity (S’): > 10 cm/s
* RV fractional area change (FAC): > 35%
* RV global longitudinal strain (GLS): < -20%
* RV end diastolic diameter (RVEDD): < 41 mm
* Tricuspid regurgitation pressure gradient (TRPG): < 31 mmHg
* Left ventricular posterior wall (LVPW): < 11 mm