

The prognostic value of speckle tracking echocardiography in patients hospitalized with COVID-19

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Introduction: In COVID-19 patients, both preexisting cardiovascular disease as well as cardiac injury resulting from SARS-CoV-2 infection are associated with increased mortality. We hypothesized that novel parameters of myocardial function may be useful in the assessment of in-hospital and long-term prognosis.

Aim: The aim of study was to determine the prevalence of myocardial dysfunction revealed by speckle tracking echocardiography and its association with in-hospital and one-year mortality.

Methods: The study group comprised 192 patients hospitalized in the cardiology department due to COVID-19. All patients underwent transthoracic echocardiographic examination with off-line analysis. Using speckle tracking technique, we measured the following parameters: left ventricular global longitudinal strain (GLS), right ventricular global longitudinal strain (RV-GLS), right ventricular free wall strain (RV-FWS) and myocardial work parameters – global work index (GWI), global wasted work (GWW), global constructive work (GCW) and global work efficiency (GWE). The primary outcome was in-hospital and one-year mortality.

Results: 112 patients (mean age 68±14 years, 76 (68%) male) had adequate image quality to evaluate strain-derived parameters. 27 patients died during hospitalization and 44 patients died within one-year after discharge. In-hospital non-survivors were older, had lower baseline oxygen

saturation (SpO₂) and had higher NTproBNP (Table 1). In non-survivors speckle-tracking echocardiography revealed significant impairment of left and right ventricular function compared to the group of survivors (Table 1). The independent predictors of in-hospital death were GWE (OR 0.85; 95% CI 0.78–0.93) and SpO₂ on admission (OR 0.91; 95% CI 0.86–0.96). Based on the ROC curve analysis, the optimal cut-off points for predicting in-hospital death were identified: GWE ≤87% (sensitivity 63%, specificity 89%) and baseline SpO₂ value ≤88% (sensitivity 81%, specificity 71%).

The independent predictors of one-year mortality were: age (OR 1.28 [1.13–1.46]), NTproBNP (OR 1.002 [1.001–1.003]), baseline SpO₂ (OR 0.71 [0.59–0.86]) and RV-GLS (OR 1.32 [1.12–1.55]). Based on the ROC curve analysis, the cut-off points optimal for predicting death within 12 months after COVID-19 were also identified: baseline SpO₂ value ≤88% (sensitivity 69.8%, specificity 77.3%), age >60 years (sensitivity 90%, specificity 43%), NTproBNP >500 pg/ml (sensitivity 95%, specificity 41.8%), RV-GLS >–18.5 (sensitivity 93%, specificity 64.2%).

Conclusions: Two-dimensional speckle tracking echocardiography is a useful technique to evaluate myocardial function in COVID-19 patients and provides good prognostic value for identifying patients at risk of death during hospitalization and in long term follow-up.

Table 1.

	Non-survivors (n=27) Mean ±SD [IQR]	Survivors (n=85) Mean ±SD [IQR]	P-value
Clinical data			
Age [years]	71±10	64±15	0,032
Female, n (%)	8 (30%)	26 (31%)	0,884
Body mass index, kg/m ²	29±7	29±4	0,878
SpO ₂ on admission [%]	79±13 [88 (80 – 88)]	91±8 [94 (88 – 97)]	<0,001
NTproBNP [pg/ml]	8641±15064 [1642 (963 – 8578)]	3537±8625 [1643 (308 – 3122)]	0,032
Echocardiographic data			
Left ventricular ejection fraction [%]	47,8±13,2	49,5±10,7	0,715
GLS [%]	-12,7±4,1	-16,0±4,5	<0,001
GWl [mmHg%]	1275,4±476,6	1564,5±573,8	0,019
GWE [%]	85,9±7,6	91,0±14,8	<0,001
GWW [mmHg%]	192,0±112,2	108,7±64,6	<0,001
GCW [mmHg%]	1462,9±542,8	1854,2±636,1	0,004
RV GS [%]	-13,3±5,1	-17,5±6,0	<0,001
RV FWS [%]	-15,3±3,6	-20,2±5,7	<0,001