Subclinical left ventricular dysfunction demonstrated by strain imaging echocardiography in moderate to severe COVID-19 patients (Delta variant, single center study)

C.W. Wuttichaipradit¹, C.T. Yodwut¹, P. Sukhum¹, K. Hengrussamee¹, M. Treesong¹, S. Thiangtham¹, B. Samut¹, A. Tunhasiriwet¹

¹Bangkok Heart Hospital, Bangkok, Thailand

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Background: Cardiovascular complications in acute coronavirus disease 2019 (COVID-19) are well established and are the main contributors to morbidity and mortality. The echocardiographic investigation in these patients upon hospitalisation for COVID-19 infection, however, is relatively constrained due to the high contagiousness risk. Recent studies (1,2) have shown the subclinical myocardial dysfunction defined by left ventricular longitudinal strain (LV-GLS) but these studies were limited the number of patients. Numerous moderate to severe COVID-19 patients in our hospital were subjected to echocardiographic examination during admission in the delta variant period (full screening protocol). Therefore, this beneficial data ought to be made available to the public health.

Objectives: This study aims to demonstrate the prevalence of subclinical left ventricular (LV) dysfunction by strain imaging echocardiography, defined as LV-GLS, and its correlation to cardiac and inflammatory biomarkers in COVID-19 patients during admission in the delta variant era.

Methods: Retrospective historical review was performed from the track-care system. Post-processing analysis of strain imaging by speckle tracking echocardiography (STE) using Tomtec imaging system, COVID-19 patients who admitted in the intermediate care unit or intensive care unit and obtaining echocardiographic study during hospital stay with optimal echocardiographic imaging to provide STE (according to EACVI/ASE 2015 consensus)³ during April 2021 to March 2022, were enrolled into the study. LV-GLS > -18% was defined as subclinical LV dysfunction. We described the number and percentage of patients who had decreased left ventricular ejection fraction (LVEF) and expressed it in relation to the decreased LV-GLS and normal LV-GLS (Table 1). The correlation between LV-GLS and biomarkers (troponin-I, C-reactive protein, and interleukin-6) was analysed by Pearson correlation.

Results: Initially, 247 patients with COVID-19 confirmed by RT-PCR and having an echocardiogram were enrolled, but only 176 patients with adequate echocardiographic imaging (44.3% female) and a mean age of 69.1 ± 16.8 were analysed by an experienced cardiologist. Of 24 patients (13.6%) had decreased LVEF and all of patients in this group had decreased LV-GLS (-9.28% ± 3.7%). 98 of 152 patients (64.5%) in normal LVEF group had decreased LV-GLS (-14.1% ± 3.1%). The correlation between LV-GLS and biomarkers revealed only troponin-I had statistically significant correlation with LV-GLS (r = 0.52, p < 0.001), but C-reactive protein and interleukin-6 were not exhibited significant correlation with LV-GLS (r = 0.11, p = 0.17 and r = 0.09, p = 0.38, respectively).

Conclusions: Subclinical LV dysfunction as demonstrated by LV-GLS was not uncommon in patients with moderate to severe COVID-19 infection (delta variant era), especially if the patients had elevated cardiac troponin levels.
### Incidence of depressed LVEF and decreased LV-GLS in moderate to severe COVID-19 infection (Delta variant)

<table>
<thead>
<tr>
<th>Normal LV-GLS 54. (30.7%)</th>
<th>Normal LVEF 152 (86.4%)</th>
<th>Depressed LVEF* 24 (13.6%)</th>
<th>Troponin I (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLS -20.6% ± 2.14%</td>
<td>54 (35.5%)</td>
<td>0</td>
<td>50.1 ± 80.3</td>
</tr>
<tr>
<td>Decreased LV-GLS** 122 (69.3%)</td>
<td>98 (64.5%)</td>
<td>24 (100%)</td>
<td>2,419.5 ± 831.23</td>
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<tr>
<td>GLS -14.1% ± 3.1%</td>
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<td>GLS -9.28% ± 3.7%</td>
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* Depressed LVEF is defined according to ASE guideline 2015.
** LV-GLS > -18% is defined as decreased LV-GLS.

Proportion of decreased LV-GLS in COVID

![Graph showing incidence of depressed LVEF and decreased LV-GLS in COVID-19 infection](image)

Impaired LV-GLS and troponin I level