

## Assessment of Right Ventricular Systolic Function in COVID 19 and Non COVID19 Pneumonic Patients in Intensive Care Unit

A.A. Alaiote, M.H. Elemery, S.A. Mostafa and H.H Ebaid

Cardiology, Dept., Faculty of Medicine, Benha Univ., Benha, Egypt

E-mail: Ali.alShahat20@fmed.bu.edu.eg

### Abstract

**Background:** The COVID-19 disease is responsible for a systemic inflammatory activation which may affect the overall cardiovascular system. **Aim of the study:** investigate the occurrence of right ventricular dysfunction among Pneumonic COVID 19 and non COVID19 patients via echocardiography. **Methods:** This study is a prospective study that was conducted on 200 patients, divided into two groups: Group one: patients with COVID 19 pneumonia in ICU (n=100). Group two: patients with Non COVID 19 pneumonia in ICU (n=100). **Results:** Regarding ECG changes ST deviation was higher in covid group (17 patients) as compared with non covid group (7 patients) with p-value (0.02957). Regarding ECG changes AF was higher in covid group (11 patients) as compared with non covid group (one patient) with p-value (0.0193) Regarding Right ventricular failure significantly higher in in COVID group compared to Non-COVID group as 21 patients (21%) belong to COVID group and 7 patients (7%) belong to Non-COVID group with p-value (p=0.00433). **Conclusion:** The occurrence of right ventricular dysfunction or failure in COVID is higher than non COVID.

**Keywords:** Ventricular; Systolic Function; pneumonia; COVID 19

### 1. Introduction

Reduced right ventricular (RV) activity is a good predictor for heart failure and cardiac mortality[1].

Several parameters have been suggested for echocardiographic evaluation of the RV. The simplest and most commonly used parameter is visual assessment. The reliability of visual quantification has been evaluated in previous studies; the authors concluded that eyeballing alone is insufficient to quantify RV function. However, factors influencing visual assessment and its actual use in various parts of the world remain ambiguous [2].

Guidelines for TTE assessment of the right heart demand the use of at least one quantitative parameter in addition to visual gradation. Several studies have demonstrated the value of tricuspid annular plane systolic excursion (TAPSE) [3], tissue Doppler imaging of the basal free lateral wall of the RV (S') [4].

### 2. Subjects and Methods

This study is a prospective study that was conducted in the Cardiology Department at Benha University Hospital and Ahmed Maher Teaching Hospital from the period of April 2021 to January 2022 for patients were diagnosed as pneumonic patient in ICU. Data from 200 patients was recorded. Patients were divided into two groups:

- **Group one:** patients with COVID 19 pneumonia in ICU (n=100).
- **Group two:** patients with Non COVID 19 pneumonia in ICU (n=100).

#### Inclusion criteria:

- Patients diagnosed with pneumonia either caused by Covid 19 or other causes needed ICU admission with age more than 25 years and less than 80 years.

#### Exclusion criteria:

The following patients were excluded from the study:

- patients with Cardiogenic Shock or who had left sided heart failure
- Patients with end stage malignancy, hepatic or renal or who had COPD.
- Patients or their relatives refusing participating in the study.

All subjects were analyzed thoroughly as regards history and clinical examination. A 12-lead surface ECG was done for each patient. Echocardiography was done to all subjects; LV systolic function was assessed on the basis of EF estimated with Biplane Simpson's method and Teichholz method [5]. RV dimensions will be measured. RV systolic function will be assessed by tricuspid annular plane systolic excursion (TAPSE) and S wave in tissue Doppler imaging. Assessment of Tricuspid Regurgitation and Pulmonary artery systolic function.

### 3. Statistical analysis

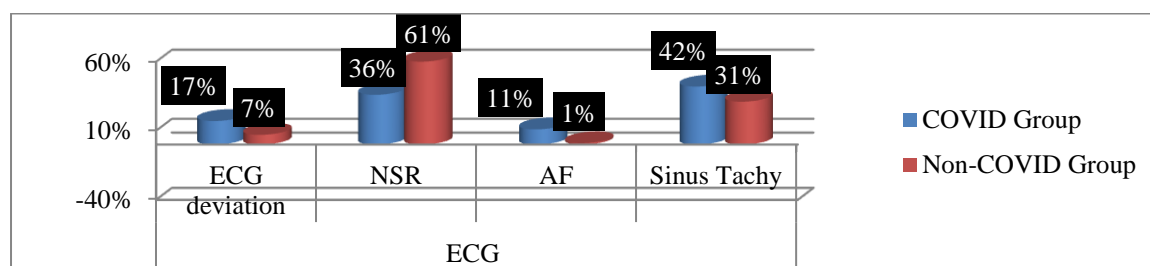
Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). The quantitative data were presented as mean± standard deviation and ranges when their distribution was parametric (normal). Also qualitative variables were presented as number and percentages. *The following tests were done: Independent-samples t-test* of significance was used when comparing

between two means & *Mann Whitney U test*: for two-group comparisons in non-parametric data. The Comparison between groups with qualitative data was done by using *Chi-square test* and *Fisher's exact test* instead of Chi-square test only when the expected count in any cell less than 5. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, P-value  $\leq 0.05$  was considered significant.

#### 4. Results

**Table (1)** Comparison between COVID group and Non-COVID group according to ECG

ECG	COVID	Non-COVID Group (n=100)	Total (n=200)	Test value	p-value
Sinus rhythm with ST deviation	17	7	24 (12.0%)	4.7348	0.02957
Sinus rhythm without ST deviation	30	61	91 (45.5%)	9.6425	0.0093
AF	11	1	12 (6%)	7.1809	0.01936
Sinus Tachycardia	42	31	73 (36.5%)	2.1573	0.14189



**Fig. (1)** Comparison between COVID group and Non-COVID group according to ECG

Regarding RV function, TAPSE was significantly lower in covid group ( $15.13 \pm 2.589$ ) compared to non covid group ( $17.61 \pm 2.142$ ) with p-value (0.00301). [Table2].

**Table (2)** Comparison between COVID group and Non-COVID group according to TAPSE

Right ventricular echocardiographic parameter	COVID Group (n=100)	Non-COVID Group (n=100)	Total (n=200)	Test value	p-value
<b>RV function TAPSE</b>					
Mean $\pm$ SD	15.13 $\pm$ 2.589	17.61 $\pm$ 2.142	16.37 $\pm$ 2.365	t= 3.042	0.00301
Range	12.1–19	14–22	12.1–22		

#### 5. Discussion

According to the results of our study, there is statistically significant difference for Right ventricular systolic function between covid-19 and non covid-19 pneumonic patients in ICU.

The results published by Bertini M et al, [6] study that showed cross-sectional, retrospective analysis of 431 consecutive COVID-19 patients hospitalized in 2020. Atrial fibrillation was detected in 22% of the patients.

Our results were in agreement with the study published by Schoot et al, [7] included

This study included a total of 200 patients, 100 patients with COVID19 and 100 patients Non-COVID.

Regarding ECG changes ST deviation was higher in covid group (17 patients) as compared with non covid group (7 patients) with p-value (0.02957).

Regarding ECG changes AF was higher in covid group (11 patients) as compared with non covid group (one patient) with p-value (0.0193) [Table 1, Figure 1].

Regarding ECG changes Sinus Tachycardia was higher in covid group (42 patients) as compared with non covid group (31 patients) with p-value (0.14189).

1780 SARS-CoV-2 patients, 66 patients of them were admitted to ICU. Right ventricular (RV) dilation was present in 49 (74.2%) of those ICU patients.

Also the results of our study were consistent with the results published by Barhan et al, [8] as the results demonstrate that right ventricular function decreased due to COVID-19 infection.

Also the results of our study were consistent with the results published by Szekely et al, [9] that the most common cardiac pathology was RV dilatation and dysfunction (observed in 39% of patients).

## 6. Conclusion

The occurrence of right ventricular dysfunction or failure in COVID is higher than non COVID.

### Conflict of interest:

No conflicts of interest

### Funding disclosure:

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