Letter to the Editor

Post resuscitation myocardial dysfunction and echocardiographic characteristics following COVID-19 cardiac arrest

To the Editor,

Post resuscitation myocardial dysfunction (PRMD), characterized by both systolic and diastolic dysfunction is seen in as many as 68% of the patients following cardiac arrest resuscitation and is associated with worse outcomes.[1,2] Currently, the incidence and characteristics of PRMD in patients with COVID-19 is not known. We report the first case series of COVID-19 patients who experience PRMD after in-hospital cardiac arrest (IHCA).

Table 1 – Demographics, comorbidities, characteristics, resuscitation outcomes, and echocardiography pattern for COVID-19 patients who had an in-hospital cardiac arrest.

Characteristic	Total (31)	No PRMD (17)	PRMD (14)	p-value
Age (yr.), median (IQR)	67 (52–73)	68 (56–71)	67 (52–73)	0.89
Male sex, no (%)	22 (71)	12 (71)	10 (71)	1.00
BMI, median (IQR)	31 (28–35)	33 (28–37)	29 (26–33)	0.13
White Race, no (%)	14 (45%)	10 (59)	4 (29)	0.12
Comorbid conditions, no (%)				
Coronary artery disease	7 (23)	1 (6)	6 (43)	**0.03**
Hypertension	22 (71)	13 (76)	9 (64)	0.69
Diabetes mellitus	18 (58)	9 (53)	9 (64)	0.52
Chronic obstructive lung disease	6 (19)	2 (12)	4 (29)	0.37
End stage renal disease	9 (29)	5 (29)	4 (29)	1.00
APACHE II score at admission, median (IQR)	13 (10–18)	13 (10–15)	13 (11–20)	0.25
Mechanically Ventilated, no (%)	14 (45)	9 (53)	5 (36)	0.32
Required Vasopressors, no (%)	10 (32%)	5 (29)	5 (36)	1.00
Initial Rhythm, no (%)				0.66
PEA/Asystole	27 (87)	15 (88)	12 (86)	
V. Fib/ P. VT	4 (13)	2 (12)	2 (14)	
Duration of CPR (min), median (IQR)	6 (3–11)	4 (2–10)	8 (5–11)	0.08
Received Defibrillation, no (%)	7 (23)	5 (29)	2 (14)	0.41
Post ROSC Hypothermia (33c), no (%)	9 (29)	3 (18)	6 (43)	0.23
Discharged from hospital alive, no (%)	17 (55)	9 (53)	8 (57)	0.82
Initial post arrest echocardiography				
Timing, median (IQR), hours	16 (3.5–28)	18 (6–44)	16 (4–27)	0.71
LV EF%, median (IQR)	53 (30–65)	64 (55–67)	27 (20–40)	**<0.001**
PRMD, no (%)	14 (45)	0 (0)	14 (100)	
LV Global dysfunction	9 (29)	0 (0)	9 (64)	**0.001**
LV RWMA	5 (16)	0 (0)	5 (36)	**0.01**
Combined RV systolic dysfunction	4 (13)	0 (0)	4 (29)	**0.03**
Isolated RV dysfunction, no (%)	0 (0)	0 (0)	0 (0)	–
Pericardial Effusion, no (%)	5 (16)	0 (0)	5 (36)	0.03
Follow up echocardiography, no (%)	9 (29)	3 (18)	6 (43)	0.23
Timing, median (IQR), days	43 (9–51)	62 (52–72)	13 (5–49)	0.38
EF%, median (IQR)	60 (55–61)	60.5 (60–61)	55 (53–60)	0.81
PRMD recovery, no (%)	5/9 (56)	–	5/6 (83)	–

PRMD, Post resuscitation myocardial dysfunction; BMI, body mass index; APACHE II score, acute physiology and chronic health evaluation II score; VTE, venous thromboembolism, PEA, pulseless electrical activity; P.VT, pulseless ventricular tachycardia; V.Fib, ventricular fibrillation; CPR, Cardiopulmonary resuscitation; ROSC, return of spontaneous circulation; ICU, intensive care unit; LOS, length of stay; EF; ejection fraction; LV, left ventricle; RV; right ventricle; RWMA, regional wall motion abnormality; – no statistics are computed.

This single healthcare system, multi-center, retrospective cohort study, included patients aged ≥18 years admitted with COVID-19 to the Cleveland Clinic Health System's ten hospitals in North-East Ohio who subsequently experienced IHCA between 03/01/2020 and 03/31/2021. Data were extracted from the electronic medical records and supplemented with data from a quality improvement registry.

During the study period, 227 COVID-19 patients suffered IHCA; 48/227 (21.15%) were discharged alive from the hospital. Further, 31 patients who underwent echocardiography within the first 72 h were evaluated for PRMD. PRMD was observed in 45% (14/31) of the patients; of these, 8 survived to hospital discharge. LV global dysfunction was seen in 9/14 (64%) patients, 4/14 (27%) patients had combined LV and RV systolic dysfunction; 5/14 (36%) patients had regional wall motion abnormalities, and pericardial effusion was noted in 5/14 (36%) patients. Follow-up echocardiography was performed on 6/14 patients; 5/6 patients showed complete recovery from PRMD.

There were no significant differences in demographic characteristics between those with or without PRMD (Table 1), nor in resuscitation parameters such as duration of resuscitation or initial arrest rhythm, for example. As previously reported, patients with known coronary artery disease have a higher degree of PRMD.[3] In our small case series, 6 out of 7 patients with coronary artery disease had developed post-arrest PRMD.

COVID-19 disease is associated with several cardiac complications [4]. Myocarditis in COVID-19 patients, and based on our study, PRMD in COVID-19 are two conditions that need special consideration due to reversible nature of the entities in this cohort. The treatment of PRMD includes hemodynamic supportive care with inotropes and or mechanical circulatory support along with routine post arrest care with targeted temperature management.[5] This supportive care strategy is designed to bridge an initial period of inflammatory injury and lead to recovery of myocardial function often within days. Lastly, although early reports suggested 100% mortality after IHCA for patients with COVID-19, over the last 24 months there have been an improvement in survival after IHCA in patients with COVID-19. As a result, PRMD in COVID-19 patients will become a clinical burden requiring serial echocardiography to guide management in the days following cardiac arrest resuscitation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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