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IHJ Cardiovascular Case Reports (CVCR) 5 (2021) 142–144

Contents lists available at ScienceDirect

IHJ Cardiovascular Case Reports (CVCR)

journal homepage: www.elsevier.com/locate/ihjccr

Case Report

ST-elevation myocardial infarction in patients with Covid-19 – A case series

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ARTICLE INFO

Article history:
Received 2 April 2021
Received in revised form
14 July 2021
Accepted 15 October 2021

Keywords:
ST-Elevation myocardial infarction
Covid-19
Revascularization

ABSTRACT

Choice of initial revascularization strategy is unclear in Covid-19 patients with acute ST-elevation myocardial infarction (STEMI). We present clinical, angiographic profile, and response to therapy in 09 covid-19 STEMI patients. STEMI was the initial presentation in 6 and developed in first-week of covid symptoms in 3 patients. D-dimer and C-reactive protein was raised in all. Right coronary artery was the most common culprit artery. Five patients underwent primary-PCI. Three out of 4 patients who underwent thrombolysis, required rescue-PCI. All 9 patients had high thrombus burden with total or near-total occlusion of culprit artery and 3 of them required thrombosuction.

1. Introduction

Coronavirus disease 2019 (Covid-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is mainly a respiratory illness but has variable presentation ranging from asymptomatic to multisystem system involvement. Very little is known about the nature of how Covid-19 infection causes injury to the heart.[1] Although acute ST-elevation myocardial infarction (STEMI) is not a common presentation in these patients, their acute management is challenging.[1,2]

We hereby described our experience of 9 cases with STEMI in covid-19 positive patients. We aimed to evaluate incidence, clinical presentation, angiographic findings, and clinical outcomes of STEMI in patients with covid-19 at our center. Data were collected retrospectively. All patients with STEMI who were covid-19 positive at any time prior or at the time of infarction were included in the study. Covid-19 was confirmed with reverse transcription–polymerase chain reaction assays (RT-PCR). Diagnosis of STEMI was guideline defined, based on the presence of typical symptoms associated with ST-segment elevation or new left bundle-branch block.[3] A stenosis was considered as the culprit lesion in case of angiographic evidence of thrombotic occlusion.

2. Case presentation

Between May 2020 to October 2020, total 686 covid-19 positive patients were admitted and treated at our hospital. Of them, total 9 patients with STEMI were included in this study. Detail demographic, clinical and laboratory profile is described in Table 1. The mean age of patients was 55.44 years. Six (66.66%) patients had no identifiable conventional coronary artery disease (CAD) risk factor while 3 (33.33%) patients had one or more identifiable risk factors. Of these 3 patients with risk factors, one who had history of left coronary artery stenting 1 year back, presented with stent thrombosis. D-dimer and C-reactive protein was elevated in all patients with mean level of 2.91 ng/mL and 18.54 mg/L respectively. Mean troponin-T and creatine phosphokinase-MB (CPKMB) was 31.63 ng/mL and 53.29unit/L. On high resolution computer tomography chest, the CT-severity score for covid-19 was mild in all except one who had moderate disease. Three (33.33%) patients had ST-segment elevation in anterior precordial leads suggestive of anterior wall myocardial infarction, 5 (55.56%) in inferior leads suggestive of inferior wall infarction, and 1 (11.11%) in inferior and lateral leads suggestive of inferolateral myocardial infarction. On echocardiogram, all patients had regional wall motion abnormalities correlating to electrocardiographic changes.

The three patients (number 1, 2, and 3 in table) were tested positive RT-PCR for COVID-19 during an evaluation for fever, cough and other nonspecific symptoms, who were at home quarantine and on supportive treatment for covid-19. They presented with STEMI on 4, 6 and 7th day from the onset of covid-19 symptoms.

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https://doi.org/10.1016/j.ihjccr.2021.10.005

Table 1
Demographic, clinical and laboratory profile of all patients.

Patient serial number	1	2	3	4	5	6	7	8	9
Age	52	67	41	38	67	47	62	63	62
Sex	M	F	M	M	M	M	M	M	F
Risk factors for CAD									
BMI	19.7	25.6	20.2	19.8	21.6	19.5	20.9	21.3	20.7
HTN	N	N	N	N	N	N	N	N	Y
Diabetes	Y	N	N	N	N	N	Y	N	Y
Dyslipidemia	N	N	N	N	N	N	N	N	N
Smoking	Y	N	N	N	N	N	N	N	N
Family history of CAD	N	N	N	N	N	N	N	N	N
CKD	N	N	N	N	N	N	N	N	N
Prior CAD	Y	N	N	N	N	N	N	N	N
Symptoms at the time of ST-elevation myocardial infarction									
Chest pain	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyspnea	Y	N	N	N	Y	Y	Y	N	Y
Fever	Y	N	Y	N	N	N	N	N	N
Cough	Y	Y	N	N	N	N	N	N	N
ST changes in ECG	AW	IW	IW	IW	IW + PW	AW	IW + LW	IW	AW
RWMA at admission	AW	IW	IW	IW	IW + RV	AW	IW + LW	IW	AW
LVEF (%)	35	58	55	50	45	40	40	55	34
Troponin-T (ng/mL)	80.6	0.95	0.08	35.6	10.2	56.9	1.3	1.5	97.5
CPK-MB (Unit/L)	39	20	20	36	58	42.6	23	24	217
D-dimer (ng/mL)	9.2	3.46	2.45	1.77	1.68	0.64	0.6	1.61	4.8
CRP (mg/L)	28.5	22.7	24	12	12	19	12	13.7	23
LDH (Unit/L)	286	276	87	375	259	342	236	267	808
Spo2 (%)	90	98	95	96	97	98	98	95	92
Initial mode of revascularization	Lyse	Lyse	Lyse	Lyse	Pri. PCI	Pri. PCI	Pri. PCI	Pri. PCI	Pri.PCI
Window period (hours)	11	3	3.5	6	8	6.5	9.5	2	18
Door to niddle/balloon time (minutes)	35	30	45	NA	60	40	75	45	60
Coronary angiography									
Culprit artery	Prox. LAD	Mid RCA	Mid RCA	Distal RCA	Prox. RCA	Mid LAD	Prox. LCX	Prox. RCA	Mid LAD
Nature of culprit lesion	Thrombotic, near total	Thrombotic, 90%	Thrombotic, 90%	Thrombotic, total	Thrombotic, total	Thrombotic, total	Thrombotic, total	Thrombotic, near total	Thrombotic, 90%
Non-culprit arteries	IP	IP	N	N	IP	N	N	N	IP
HRCT Covid severity	Mod.	Mild	Mild	Mild	Mild	Mild	Mild	Mild	Mild
Total ICU stay	09	03	03	04	05	04	03	02	06
Total hospital stay	25	13	12	15	20	21	16	12	21

M; male, F; female, N; absent, Y; present, BMI; body mass index, HTN; hypertension, CAD; coronary artery disease; CKD; chronic kidney diseases, LVEF; left ventricle ejection fraction; CRP; C-reactive protein; LDH; Lactate dehydrogenase; Pri. PCI; primary percutaneous coronary intervention; LAD; left anterior descending, LCX; left circumflex, RCA; right coronary artery, IP; insignificant plaques, HRCT; high resolution computer tomography.

These patients were thrombolysed with Tenactiplase on admission. Post-thrombolysis, two of these patients had persistent chest pain and ST-elevation and underwent rescue percutaneous coronary intervention (PCI) within 8 hours of thrombolysis. Remaining one patient was symptom free and without any regional wall motion abnormality on echocardiogram after thrombolysis, who underwent coronary angiography after 2 weeks (once covid-19 report came to be negative). One patient (number 4 in table) thrombolysed for STEMI at a periphery hospital and subsequently referred to our center for intervention in view of ongoing angina, who tested covid-19 positive after admission at our center. The 5 patients (number 5 to 9 in table) who were otherwise asymptomatic, presented with acute onset of chest pain and electrocardiography changes suggestive of STEMI underwent primary PCI and later on detected to have positive RT-PCR for covid-19.

On coronary angiography, the vessel involved were left anterior descending artery in 3 patient, right coronary artery in 5 patients & left circumflex artery in 1 patient. All 5 patients who underwent primary PCI (number 5 to 9 in Table 1) had total or near-total stenosis of culprit artery with high thrombus burden. Three of them underwent thrombosuction. Following thrombosuction, remarkable cleaning of the culprit artery (Fig. 1a and b) and immediate improvement of symptoms was observed in these patients. Of 4 patients (number 1 to 4 in Table 1) who underwent initial thrombolysis, 2 were found to have total or near total stenosis and 2 had 90% stenosis with significant thrombus load. Direct stenting was done through right femoral artery in all patients after loading with asprin and ticagrelor. Thrombolysis in myocardial infarction III (TIMI III) flow was achieved in all patients. The nonculprit arteries were either normal or had insignificant plaques. No death was reported. All patients were discharged from hospital after covid-19 negative report.

3. Discussion

Viral illnesses have been associated with a number of cardiovascular complications including myocarditis, heart failure, acute myocardial infarction, venous thromboembolism and cardiac arrhythmias.[4–6] Similar to other viral illnesses like middle east respiratory syndrome coronavirus (MERS-CoV) and influenza, acute myocardial infarction has been reported in covid-19.[1,2,4,6] High sympathetic activity, extensive systemic inflammation and cytokine storm have been considered as responsible factor for plaque rupture and thrombus formation in these viral infections.[1,2,4,6,7] The absence of conventional CAD risk factors in 60% of our STEMI patients also supports this hypothesis. An increased risk of acute myocardial infarction with in the first 7 days of disease diagnosis for influenza and other viruses has been reported.[4] However, STEMI has been reported as a late complication of covid-19 with a median time of 12 days from the symptom onset of covid-19.[7] Contrary to

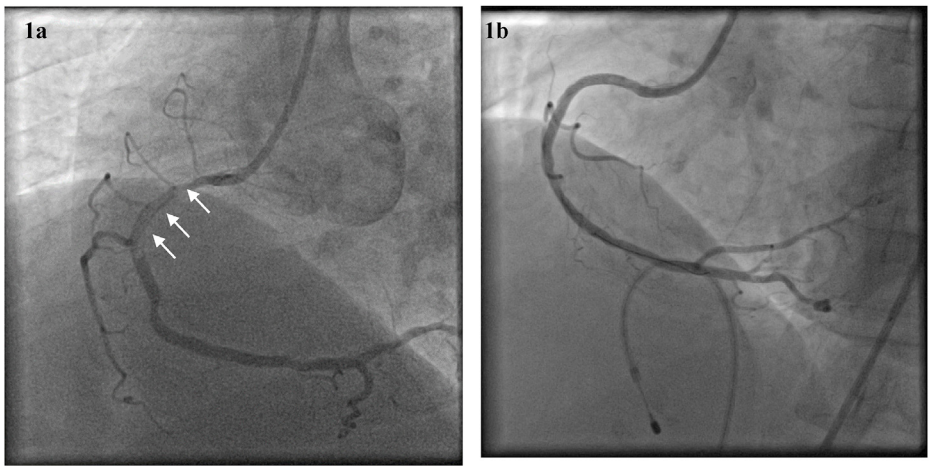

Fig. 1. Example of a covid-19 patients with inferior wall ST-elevation myocardial infarction. Right coronary angiography showing large thrombus in proximal part (**1a, arrows**). After thrombosuction, the artery get cleaned significantly with improvement in flow (**1b**).

this,[7] all our patients either presented in first week of covid-19 symptoms or the STEMI was their initial manifestation of covid-19 infection.

Although the total number of STEMI patients has been decreased during covid-19 pandamic, the management of STEMI in covid-19 patients is really challenging specifically for the choices of initial treatment (thrombolysis Vs PCI) and safety of health professionals.[1,7] Many experts suggested that a strategy relying on systemic fibrinolysis is not justified, because reperfusion is not required in a significant proportion of patients with covid-19 with STEMI.[1,2] However, at our institute we did not find any STEMI suspected covid-19 positive patient with normal epicardial coronaries on angiography. We observed a large thrombus burden in all our STEMI patients and the initial thrombolysis was failed in 3 out of 4 patients. This observation also supports the previous reports that thrombolysis is not justified in these patients if the facility of primary PCI is available.[3,8]

4. Conclusion

Covid −19 positive are at risk of STEMI, particularly in the first week of illness and it can be the first clinical manifestation in them even in the absence of conventional CAD risk factors. The primary-PCI should be the standard of care for STEMI in covid-19 confirmed or probable patients at PCI capable hospitals.

Funding

None.

Ethical considerations

The study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its amendments. Informed written consent was taken from the patient concerned. No patient identity particulars have been disclosed.

Contributorship statement

Amitabh poonia and Priya giridhara prepared the manuscript, Vinod sharma and Yogendra kumar arora edited the manuscript. All authors approved the final version.

Declaration of competing interest

The authors declare that they have no Conflict of interest.

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