

ST-Elevation Myocardial Infarction in Patients with COVID-19: Clinical and Angiographic Outcomes

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Coronavirus disease 2019 (COVID-19) due to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is causing a dramatic pandemic.¹ Lombardy, in northern Italy, is one of the regions most affected worldwide.² Cardiovascular complications occur frequently in COVID-19 patients,³ with challenges in the acute management. We aimed to evaluate incidence, clinical presentation, angiographic findings, and clinical outcomes of ST-elevation myocardial infarction (STEMI) in COVID-19 patients.

All hospitals with catheterization laboratories in Lombardy were contacted to collect cases of patients with confirmed COVID-19 whom underwent an urgent coronary angiogram due to STEMI between February 20 (date of first COVID-19 case in Lombardy) and March 30, 2020.² Data were collected retrospectively, in anonymized fashion without any sensitive data, therefore not requiring institutional review board approval. COVID-19 was confirmed a reverse transcription–polymerase chain reaction assays. STEMI was defined based on the presence of typical symptoms associated with ST-segment elevation or new left bundle branch block (LBBB).⁴ A stenosis was considered as culprit lesion in case of angiographic evidence of thrombotic occlusion/subocclusion. Obstructive coronary artery disease was defined based on the angiographic evidence of a stenosis >50% on visual estimation.

A total of 28 COVID-19 patients with STEMI were included. All patients met guideline-definition of STEMI⁴ with localized ST-elevation (25 patients, 89.3%) or new LBBB (3 patients, 10.7%), and were all treated in the setting of emergent activation. The **Table** displays a detailed overview of each included patient. The mean age was 68±11 years, 8 patients (28.6%) were women, 20 (71.4%) had arterial hypertension, 9 (32.1%) had diabetes mellitus, 8 (28.6%) had chronic kidney disease, and 3 (10.7%) had a prior myocardial infarction.

For 24 patients (85.7%) the STEMI represented the first clinical manifestation of COVID-19, and did not have a COVID-19 test result at the time of coronary angiography. The remaining 4 patients suffered from STEMI during hospitalization for COVID-19. Twenty-two patients (78.6%) presented with typical chest pain associated or not with dyspnea, 6 patients (21.4%) had dyspnea without chest pain.

On echocardiography, 23 patients (82.1%) had localized wall motion abnormalities, 3 (10.7%) had diffuse hypokinesia, and 2 (7.1%) did not have abnormalities. The left ventricular ejection fraction was <50% in 17 patients (60.7%). All patients underwent urgent coronary angiography and none was treated with fibrinolysis. Out of 28 patients, 17 patients (60.7%) had evidence of a culprit lesion requiring revascularization and 11 patients (39.3%) did not have obstructive coronary artery disease.

As of March 31, 2020 (median follow-up 13 days, interquartile range 2-20 days), 11 patients (39.3%) died, 1 (3.6%) was still hospitalized in intensive care unit, and 16 (57.1%) had been discharged.

During the COVID-19 outbreak the regional STEMI-network was reorganized² and we have been observing a reduction in the number patients presenting with STEMI.

Both factors might have contributed to the relative low number of cases observed during the study period. However, considering the cardiovascular risk profile of COVID-19 patients, many of these are expected to suffer from STEMI in the upcoming months. Evidence-based strategies are mandatory to guide their clinical management. Our findings provide relevant evidence showing that, while all patients had a typical STEMI presentation, angiography demonstrated the absence of a culprit lesion in 39.3% of cases, therefore excluding a type 1 myocardial infarction.

A recent document from the American College of Cardiology's Interventional Council and the Society of Cardiovascular Angiography and Intervention discusses how to guarantee state-of-the-art treatment as well as safety of healthcare providers involved in management of STEMI in the context of a COVID-19 outbreak.³ The document recommends to weight carefully the balance between healthcare providers exposure and patient benefit. Our findings underscore that all efforts should be made to differentiate between type 2 myocardial infarctions and myocarditis versus type 1 myocardial infarctions.

Our findings also show that a strategy relying on systematic fibrinolysis is not justified, since reperfusion appears not to be required in a significant proportion of COVID-19 patients with STEMI.

We acknowledge that this is an early report on a relatively small number of patients. However, we wish to underscore to have systematically collected COVID-19 patients with STEMI in Lombardy during the first 6 weeks of outbreak.

In patients in whom a culprit lesion was excluded by coronary angiography we were unable to determine whether the clinical presentation was due to a type 2 myocardial infarction, to a myocarditis subsequent to SARS-CoV-2 infection, to SARS-CoV-2-related endothelial dysfunction, or to a cytokine storm. Further investigations are needed to fully elucidate the pathophysiology of myocardial injury in COVID-19 patients.

In conclusion, our findings show that STEMI may represent the first clinical manifestation of COVID-19. In approximately 40% of COVID-19 patients with STEMI, a culprit lesion is not identifiable by coronary angiography. A dedicated diagnostic pathway should be delineated for COVID-19 patients with STEMI, aimed at minimizing patients procedural risks and healthcare providers risk of infection.