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## Myocardial Infarction in Covid-19 Era: A Dramatic Dip into the Past?

### ABSTRACT

February 21, 2020 marks the beginning of a dramatic era in Italy. Admissions for acute myocardial infarction were significantly reduced during the COVID-19 pandemic, with a parallel increase in fatality and complication rates. Hospital admissions due to ST-segment elevation myocardial infarction of patients living in our health district, were screened between February 21st and May 3rd, end of lockdown phase one, and compared to the same time-frame of 2019. We registered 32 admissions compared to 57 in the same 2019 time-period, accounting for a significant reduction (- 43.9%;  $p < 0.01$ ). A significant delay ( $> 24$  hrs) in seeking for first medical contact after symptoms onset has been registered in 42.5% of this year patients (median time 17 hours, interquartile range 9.5-30) compared to 7.1% (median time 6 hours, interquartile range 4-9) in the same period of 2019. The time factor influenced the clinical evolution of our patients, not only in the acute phase, so we encountered more frequently conditions of cardiogenic shock with the need for hemodynamic and respiratory support, but also in the subsequent intra-hospital course we documented complications clearly related to large infarct sizes due to patient's delay such as left ventricular thrombus.

**KEYWORDS:** Covid 19; STEMI; Patient delay; Left ventricular thrombus

### MAIN TEXT

Codogno, province of Lodi, at the gates of Milan, place of production, traffic and motorway interchanges: a perfect example of the globalized world interconnected and by its nature exposed to contagion. Open to the spread of an unknown and unpredictable virus in one of its most serious forms.

February 21, 2020 marks the beginning of a dramatic era in Italy, not only for the number of deaths, but also for the striking global impact on public health services. Recent studies [1,2] have shown that during the Covid-19 pandemic, there has been a drop in ST-segment elevation myocardial infarction (STEMI) cases.

Hospital admissions due to STEMI of patients living in our health district, were screened between February 21<sup>st</sup> and May 3<sup>rd</sup>, end of lockdown phase one, and compared to the same time-frame of 2019. We registered 32 admissions compared to 57 in the same 2019 time-period (Table 1), accounting for a significant reduction in STEMI cases (- 43.9%;  $p < 0.01$ ). A significant delay ( $> 24$  hrs) in seeking for first medical contact after symptoms onset has been registered in 42.5% of this year patients (median time 17 hours, interquartile range 9.5-30) compared to 7.1% (median time 6 hours, interquartile range 4-9) in the same period of 2019.

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All patients met guideline-definition of STEMI [3] with localized ST-elevation (27 patients) or atypical electrocardiographic presentation (5 patients), and 29 were treated in the setting of emergent activation. We did not have a Covid-19 test result at the time of coronary angiography; therefore the exams were performed with all appropriate cautions as if patients had been positive to the SARS-CoV-2 test. None of the patients resulted positive to the pharyngeal swab carried out at the hospital admission.

23 patients had evidence of a culprit lesion requiring revascularization and 2 patients did not have obstructive coronary artery disease; four presented a severe left main coronary artery disease. None were treated with fibrinolysis. Two patients required an urgent surgical revascularization within 24 hours of diagnostic coronary angiography. Twelve patients (37.5%) were hospitalized in the intensive care unit for more than 96 hours and five died in hospital. Compared to 2019, patients presented more compromised clinical status, which resulted in a greater need for respiratory support, intra-aortic balloon pump and inotropic therapy. Two patients experienced post-infarct mechanical complications: a ventricular septal defect and a post infarction free-wall rupture: in both cases these complications were fatal.

As for echocardiography, 12 patients had localized wall motion abnormalities, 6 had diffuse hypokinesia, and 14 showed no abnormalities. The overall echocardiographic data of the left ventricular ejection fraction (LVEF) at the time of hospital discharge was significantly lower than last year, resulting in 8 patients with LVEF < 40%. We also noticed a significant average increase in left ventricular filling pressures (estimated using echocardiography parameters) compared to last year.

Left ventricular regional wall akinesia resulting in blood stasis, prolonged ischaemia leading to myocardial injury and a hypercoagulable state, are at the basis of thrombus formation, a feared complication of myocardial dysfunction associated with high rates of systemic embolism, morbidity, and mortality. From 24<sup>th</sup> February 2020 to 3<sup>rd</sup> May 2020 we detected as many as five cases of left ventricular thrombus.

If on the one hand we had the impression of fewer patients suffering from acute cardiovascular problems, on the other it

was clear that the perception of the hospital (and first aid) as a place of possible contagion has strongly influenced patients in referring to hospital care for highly suggestive symptoms.

The patients came to our attention rather late; the time factor influenced the clinical evolution of our patients, not only in the acute phase, so we encountered more frequently conditions of cardiogenic shock with the need for hemodynamic and respiratory support, but also in the subsequent intra-hospital course we documented complications clearly related to large infarct sizes due to patient's delay such as left ventricular thrombus.

The increased mortality caused by acute myocardial infarction in this recent period of time has also been shown by other studies [2]. Myocardial infarction during Covid-19 pandemic represents a dramatic dip into the past: our data confirm not only an increase in mortality for acute myocardial infarction, but also in the rate of major complications and in the number of patients with severe left ventricular systolic dysfunction.

"Time is myocardium" constitutes an extremely real consideration [4]. Infarct size is clearly and strongly associated with all-cause mortality and hospitalization for heart failure within 1 year [5].

It is fundamental to reassure patients that we have put the necessary precautions in place to prevent them from contracting Covid-19, but above all that we will have the necessary tools not only to face a new pandemic, but to continue to treat acute cardiac events also during a new critical phase. The emergency network has been rebuilt for all time-dependent cardiovascular diseases: we have organized an exclusive path for Covid-19 patients or suspected patients, with the use of two hemodynamics rooms, one of which is for the exclusive use for these patients and the presence of an intensive care area dedicated to their isolation and treatment.

Patients should be properly trained to recognize symptoms of acute myocardial infarction and to perform the right actions in case of a heart attack, without underestimating symptoms, such as constrictive pain chest or dyspnea and contacting immediately medical emergency service.

Finally, they must be aware that cardiovascular disease still remains the main cause of death globally.

Table 1

	Year 2019 (n=57)	Year 2020 (n=32)	p
Age	64.5 ± 12.3	63.5 ± 12.6	0.69
Sex (male)	49	27	
<b>Cardiovascular risk factors</b>			
Hypertension	53	29	0.61
Diabetes	7	5	0.7
Smoker	18	12	0.57
Dislipidemia	51	28	0.78
<b>First medical contact</b>			
Emergency medical service	22	12	0.89
Non-PCI centre	14	5	0.31
PCI centre	21	15	0.37
Patient delay (> 24 hours)	4	13	< 0.01
<b>Clinical presentation</b>			
Atypical clinical presentation	10	9	0.26
Syncope	4	3	
Acute pulmonary edema	3	4	
Sudden cardiac arrest	3	2	
<b>ECG presentation</b>			
ST-elevation anterior	16	11	
ST-elevation anterolateral	7	4	
ST-elevation inferior	18	7	
ST-elevation inferolateral	10	5	
Atypical ECG presentation	6	5	0.50
New left bundle branch block	1	0	
Widespread ST-segment depression and ST-segment elevation in lead aVR	3	4	
Isolated posterior myocardial infarction	2	1	
<b>Peri and postprocedural support</b>			
Intra-aortic balloon pump	3	6	0.04
Orotracheal intubation	3	5	0.11
Inotropes	3	6	0.04
<b>Intra-hospital outcomes</b>			
ICU time of degeny > 96 hours	3	6	0.04
Intra-hospital death	2	4	0.12
<b>Echocardiographic data</b>			
Left ventricular ejection fraction	52.6 ± 8.9	46 ± 10.3	< 0.01
Significant mitral regurgitation (moderate to severe)	3	6	0.04
E/e'	9.1±1.8	10.2±2.3	0.02
Ventricular-atrial right gradient (mmHg)	28.2 ± 5.8	31.8 ± 7.1	0.01
Apical thrombosis	1	5	0.01

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## DECLARATIONS

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