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ST-elevation myocardial infarction in the COVID-19 era

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Abstract.

The worldwide pandemic caused by the novel acute respiratory syndrome coronavirus 2 (SARS-CoV2) has resulted in a new and lethal disease termed coronavirus disease 2019 (COVID-19). The risk of adverse outcomes in patients with COVID-19 is strongly associated with advanced age, comorbidities, and pre-existing cardiovascular risk factors. Moreover, the patient experienced a delay in clinical presentation reducing numbers of daily calls for primary PCI. We aimed at formally appraise the daily incidence and corresponding symptom-to-reperfusion time in patients with AMI at our institution between March 1 and March 19, 2020, comparing the findings with the same period in 2019. Our data showed that the COVID-19 scare is associated with fewer STEMIs and NSTEMIs, as well as calls to the STEMI networks and increase in symptom-to-balloon times.

I pictured myself as a virus or a cancer cell and tried to sense what it would be like

Jonas Salk

The coronavirus-associated disease 2019 (COVID-19) pandemic due to widespread severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection, represents an unprecedented challenge for all health care systems worldwide, with enormous morbidity and mortality burdens, and a veritable unprecedented challenge for healthcare systems, including the most refined ones such as the North American one.(1-3) Recent data and overviews highlight that risk of adverse outcomes in patients with COVID-19 is strongly associated with advanced age, comorbidities, and pre-existing cardiovascular risk factors, with such features increasing the likelihood of symptomatic infection, of progression to acute respiratory distress syndrome (ARDS), of the need of extracorporeal membrane oxygenation (ECMO), and of death.(4-6) Yet, we believe another

important hazard risks being overlooked. In particular, experiencing delay in clinical presentation and reduced numbers of daily calls, we aimed at formally appraise the daily incidence and corresponding symptom-to-reperfusion time in patients with AMI at our institution between March 1 and March 19, 2020, comparing the findings with the same period in 2019.

We retrospectively abstracted and analyzed anonymized data on patients with acute myocardial infarction (AMI) treated at our institution, Santa Maria Goretti Hospital, in Latina, Italy, which represents the largest hub hospital for ST-elevation myocardial infarction (STEMI) in central Italy, with 509 STEMI cases in 2019. Notably, as with prior research efforts from our own groups and others on COVID-19, no institutional review board review was requested given lack of individual data appraisal.^(3,7) Specifically, we focused on daily rates of ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarctions (NSTEMI), calls to the STEMI network (as all at risk ECGs are analyzed at our Coronary Care Unit), and also symptom-to-balloon times. Descriptive analysis was based on counts (%), and inferential analysis on Fisher exact test. Computations were performed with Stata 13 (StataCorp, College Station, TX, USA). In comparison to the prior year, much fewer cases of ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarctions (NSTEMI) presented themselves or were referred to us (respectively 24 STEMI in 2020 vs 38 STEMI in 2019, and 13 NSTEMI in 2020 vs 51 NSTEMI in 2019), in keeping with a substantial reduction in activating calls to the STEMI network (960 in 2020 vs 1610 in 2019) (Figure 1A). Most frightening, we have observed a substantial increase in symptom-to-balloon times, which are directly associated with patient prognosis, with significantly more patients presenting to the hospital late after symptom onset ($p < 0.001$) (Figure 1B).

Analyzing our institutional experience, we found that the COVID-19 pandemic was associated with a significant decrease in the number of patients with STEMI and NSTEMI, as well as calls to the STEMI networks and increase in symptom-to-balloon times. Indeed, this finding has already been

replicated elsewhere, confirming this as an established association.(8-9) Several reasons may explain these phenomena, on top of play of chance, including a direct pathophysiologic modulating effect of SARS-CoV-2 on acute coronary syndromes. Other putative causative factors might be the impact of stress, working activity, physical activity, exposition to ambient temperature or pollution, as indeed pollutants may even impact on risk of infection or progression of COVID-19.(10-13) However, the most plausible explanations are that patients are scared and prefer not contacting emergency medical services, which are concomitantly overburdened by COVID-19.

Indeed, our hypothesis-generating findings as well as those originating from other national and international groups highlight the importance of taking care of COVID-19 as aggressively as possible, but without discounting the key role of cardiovascular disease, especially unstable coronary artery disease and severe structural heart disease, in causing substantial morbidity and mortality worldwide.(14-15) Accordingly, patients and caregivers should be aware of their ongoing risk of AMI, and activate proactively emergency services whenever typical symptoms occur. In addition, institutions should be prepared to face STEMI in COVID-19, as the substantial prevalence of this infection will end up in several patients experiencing STEMI while infected. Moreover, the plausible scenario that SARS-CoV-2 is directly injuring the heart, at least in keeping with its prevalent prothrombotic effects, means that STEMI, NSTEMI and other forms of atherothrombotic events will end up being more common in the COVID-19 era than in the past, irrespective of the higher threshold of patients to report them.(6)

In conclusion, COVID-19 scare is associated with fewer STEMIs and NSTEMIs, as well as calls to the STEMI networks and increase in symptom-to-balloon times. While recognizing the importance of tackling with the strongest possible effort the COVID-19 pandemic, patients, physicians and decision makers should remain aware that other major causes of morbidity and mortality still take

a substantial daily toll, and must be promptly recognized and addressed, in order to ensure patient safety and farewell.

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Figure 1. Comparison between activity of the Latina ST-elevation myocardial infarction (STEMI) network, the busiest in central Italy, in the coronavirus associated disease 2019 (COVID-19) period in comparison to the same period of the year before. NSTEMI=non-ST-elevation myocardial infarction. Panel A: Absolute values. Panel B: Relative values of subgroups of STEMI according to symptom-to-balloon times.

