Catheterization, Myocardial Infarction, and the COVID-19 Pandemic: The Devil Is in the Details

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The COVID-19 pandemic has caused an upheaval globally for almost 2 years, with significant impact on people's socioeconomic well-being and health. Many challenges with delivery of healthcare have emerged through this pandemic, including providing care for those with myocardial infarction (MI). Following the chaotic first few weeks of the pandemic, societal guidelines were quick to guide healthcare providers for the optimal care of patients with acute coronary syndrome (ACS) during the pandemic.[1] These guidelines have recommended the same standard of care for ST-elevation MI (STEMI) patients who are COVID-19 confirmed; however, an initial conservative strategy for those presenting with non-STEMI had been advocated.[1] COVID-19 has impacted both those with MI as well as those seeking treatment for other acute coronary syndromes. Despite the initial concern for potentially higher rates of MI secondary to COVID-19 infection, ironically a reduction in patients presenting with ACS was observed.[2] A decrease in the number of hospital admissions for STEMI and non-ST-elevation MI (NSTEMI) is consistently reported across multiple studies from different countries.[3–5] Presumptive reasons for a decrease in patients with ACS include fear of getting infected with the virus while in an overcrowded hospital, self-misdiagnosis given overlapping symptoms of MI with many other illnesses including the symptoms of COVID-19 illness, lockdown measures adopted, and social containment orders, all contributing to the "delay" in seeking medical care for MI. A delay in percutaneous coronary intervention was reported during the COVID-19 pandemic; however, this was not observed to correlate with an increase in hospital mortality.[3,5]

In this issue of *Vascular Disease Management*, Al-Abdouh et al[6] publish their retrospective analysis of the impact of the COVID-19 pandemic on the treatment of patients presenting with MI at their institution. The study includes all patients diagnosed with MI during the COVID-19 pandemic period from March through December 2020. A comparison group from the previous year 2019, for a similar 10-month duration, was selected. The definition of MI included patients with STEMI or NSTEMI with elevated troponin and evidence of obstructive coronary artery disease on cardiac catheterization. A total of 275 patients met the criteria to be included in this study, of which 134 encounters were prior to the COVID-19 pandemic (2019) and 141 were during the COVID-19 study period. Almost half of the patients were with STEMI (51% prior to COVID-19 and 45% during COVID-19). The mean age of the patients was 65 and 66, respectively. Most baseline characteristics were similar in the 2 groups except more patients had chronic obstructive pulmonary disease (COPD) during the COVID-19 study period (2020) vs pre-COVID. There was no difference in the presenting symptoms between the 2 groups; symptoms of chest pain (90.3% in the pre-COVID period and 87.2% in the COVID period) and dyspnea (37.3% vs 32.6%, respectively) were similar. Fewer patients had jaw pain in the COVID-19 group (3.5%) compared with the pre COVID-19 group (11.2%).

The major findings of their study were the lack of difference between the groups (encounters during the pandemic vs prior to the pandemic) in terms of mortality (2.1% vs 4.5%, P=.27), cardiac catheterization (94.3% vs 95.5%, P=.65), percutaneous coronary intervention (PCI) (78.8% vs 78.4%, P=.94), cardiac arrest (5.7% vs 6.0%, P=.40) and ICU admissions (7.1% vs 7.5%, P=.89). Referrals for coronary artery bypass graft (CABG) surgery, however, were significantly higher during the COVID-19 study period compared with the year prior (8.5% vs 3.0%, P=.05). In a subgroup analysis, they demonstrated a decreased rate of cardiac catheterizations during the first half of their study period of the COVID-19 pandemic, compared with the last 5 months of the pandemic (90.5% vs 98.5%, P=.04), with a concurrent increase in the rate of medical treatment alone (19.9% vs 7.5%, P=.047).

It is important to note that these patient encounters are almost exclusively in the non-COVID positive patients in their analysis. Of the 141 patients with MI during the COVID-19 study period, only 2 were COVID-19 positive. Therefore, neither does this study evaluate the incidence of MI in COVID-19 positive patients, nor can we draw conclusions about the impact of COVID-19 illness on the treatment of MI. Further, the overall results of this study contrast with multiple previous studies showing a decrease in acute coronary syndrome (ACS) and MI admissions during the COVID-19 pandemic;[7] however, they are in agreement with a decline in patient encounters, in particular during the initial months of the pandemic. This trend was not reported to be statistically significant, presumably due to the small study cohort. The reasons for this decrease are speculative and may be related to the myriad issues as noted above to include institution of a lockdown, 14-day self-quarantine mandate, limitations and

fears regarding hospital capacity because of a large surge in the admission of COVID-19 patients, exhaustion of resources, general fear among the population of contracting the virus from hospitals, and missed diagnoses. Singh et al's pooled analysis from 38 studies showed a 27.3% reduction in ACS-related hospitalizations during the pandemic.[8] Similarly, a meta-analysis of 40 pooled studies by Helal et al showed a 28.1% reduction in ACS admissions during 2020 compared with 2019.[7] Data from the ISACS-STEMI COVID-19 registry also showed a 19% reduction in PCI procedures during the pandemic.[9]

The authors did not find any difference in clinical outcomes between 2019 (pre-COVID-19) and 2020 (COVID-19), though the data are limited to the index hospitalization. There has been concern for an observed increase in out-of-hospital cardiac arrest with delays in patients seeking care for MI during the COVID-19 pandemic.[2] In addition, mechanical complications of MI, seen with delayed presentation, were reported to have increased during COVID-19 at 2 university hospitals in Taiwan.[10] This study shows higher rates of cardiac catheterization and concurrent decreased medical management during the latter half of the pandemic study period compared with the initial 5 months. This finding may highlight the effectiveness of prompt campaigns to raise awareness that were initiated soon after the observation of decrease in emergency department visits.[11,12] Simultaneously, healthcare systems were able to adapt to the demands in utilization due to COVID-19 to continue to provide care without delays.

Several limitations challenge the interpretation of these study results and limit its findings. This is a single-center experience from an urban population in Baltimore, Maryland, where only 2 patients tested positive for COVID-19 in the reported cohort. The access to healthcare, availability of hospital beds, and treatment offered may differ from the general population. Certain hospitals had COVID-19-only designations, which allowed preferential treatment of non-COVID patients at other hospitals. This, in theory, can increase emergency department visits at the non-COVID-19 hospitals—a potential reason for the lack of decrease in MI admissions at this particular hospital. Given the small sample size, adjusted analysis was not performed. The outcomes of treatment results are limited to the index hospitalization, and more long-term data evaluating the difference in outcomes is not available. Critically, only 2 patients in their study had COVID-19, a surprisingly low number for the pandemic. Since many symptoms of COVID-19, including dyspnea, hypoxia, and chest pain, may overlap with MI, the diagnosis of MI may be missed in COVID-19-positive patients.[13] Patients with concurrent COVID-19 and MI may have been inadvertently excluded and seen elsewhere in this geographic area, potentially mitigating the differences in outcomes. Multiple previous studies have documented delays in care of patients with MI and COVID-19 without a consistent association of these delays on mortality, heart failure, and mechanical complications.[1,14] Additionally, review of the Maryland COVID-19 tracker data shows that the worst peak of new daily COVID-19 cases did not occur until after the study period. Compared with March 2019, where average daily cases were approximately 1000, over 3000 new cases of COVID-19 were seen daily in January 2021. Lastly, it is possible that this center was in a low-density COVID-19 area, which did not impact the number of healthcare visits. A study from New York State showed a roughly 43% decrease in COVID-19-era STEMI admissions in counties with high COVID-19 density, compared with a negligible decrease of 4% in counties with a low density of COVID-19.[15]

As this second year of the pandemic is coming to an end, the global response to this pandemic continues to evolve. While there was an undeniable decrease in patients seeking healthcare for non-COVID-19 illnesses early during the pandemic, when including MI, this trend is no longer seen. This is likely due to more aggressive vaccination programs, mandates, continued social distancing, masks, and other personal protective equipment and education. As we continue to learn from the current pandemic, this study from Al-Abdouh et al[6] adds to the body of literature, although its limitations prevent us from drawing any conclusions regarding MI and the current COVID-19 pandemic. ■

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