



# Impact of COVID-19 on the incidence of post-acute myocardial infarction mechanical complications

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The novel coronavirus SARS-Cov-2 had gripped nearly every field of medicine since March 11, 2020, when the World Health Organization declared the coronavirus disease 2019 (COVID-19) a pandemic. The pandemic has dominated the global media, forcing people to stay home in isolation and avoid interpersonal contact. Medical centers have been converted into COVID-19 disease wards and become overwhelmed by the number of infectious cases. As a result, other diseases have been pushed into the background. COVID-19 case statistics and mortality rates are well known. What is less investigated—but may be even more critical—is statistics related to mortality and severe complications due to other medical causes that might have been avoided if not for the pandemic. According to Eurostat data, the excess mortality for 2020 for the European Union was 12% higher than the 2016–2019 annual average, which translates to about 550,000 additional deaths (1). It remains unknown how many of these were cardiovascular cases.

Time forms the basis of current management and treatment guidelines for acute myocardial infarction. Immediate reperfusion therapy is a well-established prognostic factor in ST-elevation myocardial infarction (STEMI) cases; a short ischemia time is associated with lower mortality, better clinical outcomes, and lower complication rates (2). Since the introduction of primary percutaneous coronary intervention as the gold standard reperfusion therapy for STEMI cases, the number of mechanical complications of acute myocardial infarction (AMI) has decreased to less than 1% (3). The occurrence of

mechanical AMI complications leads to rapid deterioration of patients' clinical status due to cardiogenic shock which, in most cases, leads to death. The gold standard for detecting mechanical AMI complications is transthoracic echocardiography with color-flow Doppler. Despite advanced cardiac surgical procedures and perioperative intensive care, the mortality rate in patients with mechanical AMI complications remains high. The only meaningful way to reduce this fatal statistic is to reduce mechanical AMI complications through an early reperfusion strategy. Thanks to efficient management of AMI patients in modern healthcare systems, mechanical AMI complications are a rarity in today's interventional cardiology centers.

Despite a well-developed network of interventional cardiology centers operating 24/7, the COVID-19 pandemic has resulted in a decreased number of hospitalizations due to AMI compared to the same period in previous years, varying from about 30% fewer hospitalizations in Poland to 48% in Italy and Germany (4–8). As patients are seeking professional help later, the time from symptom onset to first medical contact (FMC) has also increased and the number of latecomers with STEMI (over 12 hours of pain duration) has increased significantly (5,7,9,10). In the United Kingdom, late presentations among STEMI admissions rose from 0% pre-pandemic to 26% during the pandemic (10). An almost twofold increase in late presentations was observed in our previous study and by Aldujeli *et al.* (5,9). This phenomenon has resulted in a twofold increase in the incidence of mechanical AMI complications, worse clinical

outcomes, and higher mortality in AMI patients during the COVID-19 pandemic compared to the pre-pandemic period (5-7). De Rosa *et al.* observed an almost fourfold increase in the case fatality rate, whereas Primessnig *et al.* observed a 12.5% increase in mortality (6,7).

The significant increase in the number of mechanical AMI complications should be considered a visible effect of several socioeconomic, logistical, organizational, and psychological mechanisms that have accompanied the pandemic. The immediate cause of the increase in the incidence of mechanical AMI complications is the prolongation of pain-to-FMC time and the higher number of cases with late presentation. In the early months of the COVID-19 pandemic, patients avoided contact with health care professionals and emergency departments due to fear of SARS-Cov-2 infection. The reduced number of AMI hospitalizations and the increase in late presentations seem to confirm this conclusion. In addition, contact with general practitioners (GPs) and emergency departments was impeded in many countries due to pandemic-related protocols. GPs performed mostly teleconsultations and managed COVID-19 patients treated at home. The emergency departments of many hospitals were converted into COVID-19 specific treatment centers. During the peak wave of the pandemic, many health care systems experienced a shortage of ambulances because they were attending to patients suspected to have COVID-19. That may have also led to systemic delays and extended the time from symptom onset to diagnosis. Moreover, symptoms such as dyspnea or chest pain, which are often misunderstood by patients, may be misdiagnosed during initial medical interviews. Distinguishing between SARS-Cov-2 infection and AMI, especially non-STEMI, can initially be problematic. Adherence to COVID-19 sanitary restrictions may have prolonged the time from FMC to correct diagnosis. Primessnig *et al.* observed a significant delay from FMC to revascularization in non-STEMI patients during the COVID-19 pandemic (7). Early rapid testing with nasopharyngeal real-time reverse transcription polymerase chain reaction tests to exclude SARS-Cov-2 infection appears to be crucial for determining the correct treatment. In deteriorating patients with a long history of chest pain and hemodynamic instability, bedside echocardiographic examination may be necessary to confirm mechanical AMI complications and facilitate further therapeutic decisions. Further multicenter studies are needed to determine whether adherence to infection control procedures may have caused a delay in revascularization

and led to worse AMI treatment outcomes. It should be noted that many departments were forced to postpone non-emergency admissions and procedures due to local COVID-19 restrictions, including coronary angiography or coronary artery bypass grafting in stable patients with coronary artery disease. Delays caused by the pandemic were typically longer than the standard waiting time, and some of these patients may have experienced AMI before scheduled diagnosis or surgery, increasing the risk of complications compared with elective procedures.

In light of new variants of SARS-Cov-2 occurring worldwide, further lockdowns and restrictions seem likely. Obtaining a thorough history and bedside echocardiographic examination are critical for identifying and adequately treating patients with potential rupture of the myocardium. Mechanical AMI complications are often fatal; surgical decision-making is challenging and requires precise and close collaboration between cardiologists and cardiac surgeons. The COVID-19 pandemic has reminded us of the importance of the “time is muscle” rule in cardiology, and the dynamic increase in mechanical AMI complications during the COVID-19 pandemic is irrefutable evidence.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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