SHORT COMMUNICATION

Incidence of mechanical complications following myocardial infarction during the first two months of the COVID-19 pandemic in the Southern Poland region: a multicenter study

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Introduction Both in Poland and worldwide, the year 2020 was dominated by the coronavirus disease (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] The first case of laboratory-confirmed SARS-CoV-2 infection was detected on March 4, 2020, and on March 10, 2020, the local transmission phase of SARS-CoV-2 in Poland was reported to the World Health Organization. On March 12, 2020, Polish authorities implemented lockdown-type control measures, such as closure of schools and universities, cancellation of mass events, and limitation of social gatherings. These restrictions caused social panic and patients avoided personal contact with medical professionals, even in emergency cases such as acute myocardial infarction. At the same time, instead of personal visits in outpatient clinics, the number of telehealth visits rose.[2]

Over the past 30 years, there has been a reduction in mortality due to ischemic heart disease in Europe, largely due to early reperfusion treatment with primary percutaneous coronary interventions (PCIs) performed in acute ST-segment elevation myocardial infarction (STEMI) and non–ST-segment elevation myocardial infarction (NSTEMI).[2,3] Early PCI was associated with favorable clinical outcomes and minimized the risk of complications of acute myocardial infarction (AMI).[2,3] Long-term prognosis following the treatment of STEMI and NSTEMI is affected by numerous factors, such as patients' comorbidities, as well as by time delay in obtaining interventional treatment.[2]

TABLE 1 Incidence of acute myocardial infarction and mechanical complications in 2019 and 2020

Variable	2019			2020			Comparison of the control and study periods, %		
	March	April	Both months	March	April	Both months	March 2019 vs March 2020	April 2019 vs April 2020	2019 vs 2020
AMI (total)	521	534	1055	437	390	827	–16.1	-26.9	–21.6
STEMI	213	243	456	191	180	371	–10.3	-25.9	–18.6
NSTEMI	308	291	599	246	210	456	–20.1	-27.8	–23.9
Chest pain >12 hours	33	32	65	64	60	124	+93.9	+87.5	+90.7
Complications (total)	7	4	11	9	13	22	+28.6	+225	+100
VSR	0	0	0	1	2	3	–	–	–
FWR	2	1	3	3	2	5	+50	+100	+66.7
AMR	5	3	8	5	9	14	0	+200	+75

Data are presented as number of patients unless otherwise indicated.

Abbreviations: AMI, acute myocardial infarction; AMR, acute mitral regurgitation; FWR, free wall rupture; NSTEMI, non–ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction; VSR, ventricular septal rupture

Mechanical complications of AMI include rupture of the free wall, rupture of the ventricular septum, and acute mitral regurgitation due to rupture of the papillary muscles.[4] They negatively affect both short- and long-term survival.[5] The introduction of early primary PCI as a reperfusion treatment method in patients with STEMI reduced the incidence of the aforementioned mechanical complications to less than 1%.[4] Unfortunately, the number of PCI procedures performed in patients with NSTEMI and STEMI decreased during the COVID-19 pandemic.[6] We have therefore decided to investigate the incidence of the mechanical complications of AMI during the COVID-19 pandemic. This study aimed to compare the incidence of the mechanical complications of AMI during the first 2 months (March and April 2020) of the COVID-19 pandemic with the observation from the corresponding period in 2019.

Methods We asked the heads of 15 interventional cardiology centers performing PCIs in the Southern Poland region on a 24/7 basis to report the number of conducted AMI procedures (for both STEMI and NSTEMI), the incidence of mechanical complications, and the number of patients who presented with chest pain lasting longer than 12 hours during March and April 2019 and March and April 2020. Data were collected using a simple protocol and are presented in TABLE 1. The time interval between March and April 2019 was designated as the control period, and between March and April 2020, as the study period. We collated the number of cases from all centers that provided data. Due to the retrospective nature of the collected data, no consent of a bioethics committee was required. The Fourth Universal Definition of Myocardial Infarction according to the European Society of Cardiology was used to define AMI.[7] Mechanical complications of AMI were defined as rupture of the free wall, rupture of the ventricular septum, and acute mitral regurgitation due to rupture of the papillary muscle that occurred in the first few days following AMI, as previously described in the European Society of Cardiology guidelines.[2]

Statistical analysis Categorical variables were compared with the χ^2 test. The prevalence of endpoints was compared using risk ratios with 95% CIs. The percentage increase in the number of cases was expressed as a plus sign, and the percentage decrease in the number of cases, as a minus sign. The Statistica 13.3 software (TIBCO Software Inc., Palo Alto, California, United States) was used for all analyses.

Results and discussion Out of 15 centers invited to participate, 14 responded. Between March 1, 2019 and April 30, 2019 (the control period), the total number of patients with AMI in all centers was 1055 (456 STEMI cases and 599 NSTEMI cases). Compared with the same period in 2020 (the study period), the total number of AMI cases was 827 (371 patients with STEMI and 456 patients with NSTEMI). In comparison to the control period, we observed a 21.6% decrease in the total number of AMI cases (a 18.6% decrease in the number of patients with STEMI and a 23.9% decrease in the number of patients with NSTEMI). Data collected from 14 centers are shown in TABLE 1 and in Supplementary material, *Figure S1*.

Data regarding the incidence of mechanical complications were obtained from 11 centers, as 3 centers did not provide specific information. During the control period, we observed 11 cases of mechanical complications

of AMI: 3 cases of free wall rupture and 8 cases of acute mitral regurgitation. No case of ventricular septal rupture was reported. During the study period, we observed 22 cases of mechanical complications, which constituted a 100% increase compared with the control period, and this difference was significant (Supplementary material, *Table S1*). Detailed data are presented in TABLE 1.

We also analyzed the duration of chest pain prior to patient presentation to the hospital, specifically analyzing data on cases of pain lasting longer than 12 hours. We observed a significant increase (90.7%) in the number of patients who experienced pain longer than 12 hours (TABLE 1 and Supplementary material, *Table S1*).

The COVID-19 pandemic has posed a real-life challenge to healthcare professionals of all specialties. The reduction in hospital admissions due to AMI during the COVID-19 pandemic has been previously described in Europe and the United States and we arrived at similar findings.[6,8-10] A study published by De Rosa et al[11] showed a significant increase in the rate of major complications of AMI such as cardiogenic shock, life-threatening arrhythmias, cardiac rupture or ventricular septal defect, and severe functional mitral regurgitation; however, that study did not provide specific data about each type of complication. In the present study, we focused on the mechanical complications of AMI in particular. The reduction in hospitalization rates due to AMI might have resulted from patients' fear of presenting to the hospital during the COVID-19 pandemic and their preference to stay at home, even if serious, life-threatening symptoms occurred. This hypothesis was also confirmed by the greater number of patients presenting with chest pain lasting longer than 12 hours. As shown in previous studies, early recognition and revascularization treatment are crucial for patients with STEMI to achieve favorable outcomes and minimize the risk of major complications.[2]

Limitations Admittedly, our study had limitations. We included 14 interventional cardiology centers located in Southern Poland. The course of the pandemic may differ from region to region and its influence on population behaviors may differ as well. Even considering a potential regional variation, the reduction in hospital admissions due to AMI and the increase in complication rates were clearly evident.

Conclusions In conclusion, due to fear of COVID-19 during the pandemic in Poland, patients avoided presenting to hospitals with the symptoms of AMI. It resulted in a decreased number of hospitalizations due to AMI, longer duration of chest pain prior to hospital admission, and a higher incidence of mechanical complications of AMI.

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/kardiologiapolska.

ARTICLE INFORMATION

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CONFLICT OF INTEREST None declared.

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REFERENCES

1 Lai CC, Shih TP, Ko WC, et al. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. Int J Antimicrob Agents. 2020; 55: 105924.

2 Świerad M, Dyrbuś K, Szkodziński J, et al. Telehealth visits in a tertiary cardiovascular center as a response of the healthcare system to the severe acute respiratory syndrome coronavirus 2 pandemic in Poland. Pol Arch Intern Med. 2020; 130: 700-703.

3 Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2018; 39: 119-177.

4 Windecker S, Kolh P, Alfonso F, et al. 2014 ESC/EACTS Guidelines on myocardial revascularization: The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI). Eur Heart J. 2014; 35: 2541-2619.

5 Kutty RS, Jones N, Moorjani N. Mechanical complications of acute myocardial infarction. Cardiol Clin. 2013; 31: 519-531.

6 French JK, Hellkamp AS, Armstrong PW, et al. Mechanical complications after percutaneous coronary intervention in ST-elevation myocardial infarction (from APEX-AMI). Am J Cardiol. 2010; 105: 59-63.

7 Legutko J, Niewiara Ł, Bartuś S, et al. The decline of coronary angiography and percutaneous coronary intervention procedures in patients with acute myocardial infarction in Poland during the COVID-19 pandemic. Kardiol Pol. 2020; 78: 574-576.

8 Thygesen K, Alpert JS, Jaffe AS, et al. Fourth universal definition of myocardial infarction (2018). Eur Heart J. 2019; 40: 237-269.

9 Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. J Am Coll Cardiol. 2020; 75: 2871-2872.

10 Gąsior M, Gierlotka M, Tycińska A, et al. Effects of the coronavirus disease 2019 pandemic on the number of hospitalizations for myocardial infarction: regional differences. Population analysis of 7 million people. Kardiol Pol. 2020; 78: 1039-1042.

11 De Rosa S, Spaccarotella C, Basso C, et al. Reduction of hospitalizations for myocardial infarction in Italy in the COVID-19 era. Eur Heart J. 2020; 41: 2083-2088.