



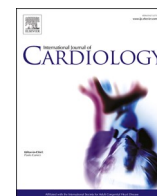
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Editorial



Mechanical complications after STEMI: Another collateral damage of the COVID-19 pandemic

In the setting of ST-elevation myocardial infarction (STEMI), free wall rupture (FWR), papillary muscle rupture (PMR) and ventricular septal rupture (VSR) are considered as mechanical complications (MC). Although there have been significant advances in the treatment of patients with STEMI, MC remain a serious determinant of adverse outcome [1]. In the era of primary percutaneous coronary intervention (PCI) and modern cardiac care units, the frequency and mortality of MC decreased [1]. Older age and female sex are considered as risk factors for the occurrence of MC [1]. Furthermore, MC rate is suggested to increase with myocardial ischemic time, with differences regarding MC entity [1].

The largest study to date, investigating the incidence and outcome of MC among circa 9,000,000 myocardial infarction hospitalizations between 2003 and 2015 in the United States, reported an overall incidence of MC of 0.27% resulting in an in-hospital mortality rate of 42.4% [1]. VSR occurred in 0.21%, being the most common mechanical infarct complication, followed by PMR (0.05%) and FWR (0.01%) [1]. Nevertheless, data on the incidence of MC depending on pre-hospital delay are scarce.

In this issue of the *International Journal of Cardiology*, Bouisset et al. investigated the incidence and outcome of MC according to pre-hospital delay and their determinants [2], based on a large registry [3]. The study included 6,185 STEMI patients, which were included in 65 French interventional cardiology centers over two periods (each March to May) in 2019 and 2020. MC occurred in 1.34% of all-comer STEMI patients. When dividing the population into groups according to pre-hospital delay (0 to 12 hours, 12 to 24 hours, 24 to 36 hours and 36 to 48 hours), an increased MC rate was observed (0.82%, 1.43%, 1.24% and 5.07%, respectively). Pre-hospital delay was independently related to the presence of MC. Of interest, in this study, concomitant COVID-19 infection was independently associated with the occurrence of MC. Further factors, which were independently related to MC, were age, female sex, absence of dyslipidemia, initial TIMI flow 0 or 1 in the culprit vessel, and absence of revascularization during coronary angiography. When comparing the 3 types of MC, the authors observed no differences regarding clinical features, apart from the circumflex artery as infarct related vessel, which was more frequent in PMR. Left ventricular aneurysm and left ventricular thrombus were more frequent in patients with MC. Moreover, occurrence of in-hospital complications

was more likely in patients with MC, including in-hospital cardiac arrest (28.9%), cardiogenic shock (39.8%) and death (47%).

Bouisset et al. investigated for the first time the relation of defined time frames of pre-hospital delay with the occurrence of MC after STEMI. However, the incidence of MC remains a controversial issue. One might speculate that the true incidence of MC may differ from the reported incidence due to variation in the different studied populations, underreporting or miscoding. In comparison to a previous study [1], incidence of MC appears higher in the study by Bouisset and colleagues. The authors speculated, that the higher rate of MC might be explained by the fact, that half of the study population was recruited during the first wave of the COVID-19 pandemic in France. In the context of COVID-19 outbreak, a sharp decline in hospitalizations for acute coronary syndromes and longer pre-hospital delays have been noted, resulting in substantial cardiac collateral damage [4–6]. Nevertheless, only 3 patients with a COVID-19 infection had a MC in the study by Bouisset et al, which underlines the need of larger studies investigating the impact of COVID-19 infection on the occurrence of MC. The authors hypothesized, that COVID-19 related inflammation and larger thrombus burden [7] could have a promoting effect on MC. Another interesting point of the study was that left ventricular aneurysm and left ventricular thrombus were more likely in patients with MC, underlining the importance of early risk stratification regarding these left ventricular pathologies [8]. The study by Bouisset et al. suggested that the overall occurrence of MC was not associated with the infarct related artery, but its entities were more likely to be related to culprit lesion location, such as the higher rate of PMR in patients with culprit lesion location in the left circumflex artery [9]. A finding that needs further validation and research. Over the last decades, reductions in MC rates are not only owed to the implementation of primary PCI, but also to improved and broader multimodality imaging use, to enable early MC detection, and emergence of multidisciplinary shock teams [10].

In conclusion, this is the first dedicated analysis that described the incidence of MC for every 12-hour interval (up to 48-hours) from symptom onset in patients with STEMI (Fig. 1). The rate of MC significantly increased with pre-hospital delay reaching its maximum above a 36-hour delay. Furthermore, concomitant COVID-19 infection could foster MC occurrence after STEMI, independently of pre-hospital delay.

DOI of original article: <https://doi.org/10.1016/j.ijcard.2021.10.020>.

<https://doi.org/10.1016/j.ijcard.2021.11.075>

Received 23 November 2021; Accepted 29 November 2021

Available online 2 December 2021

0167-5273/© 2021 Elsevier B.V. All rights reserved.

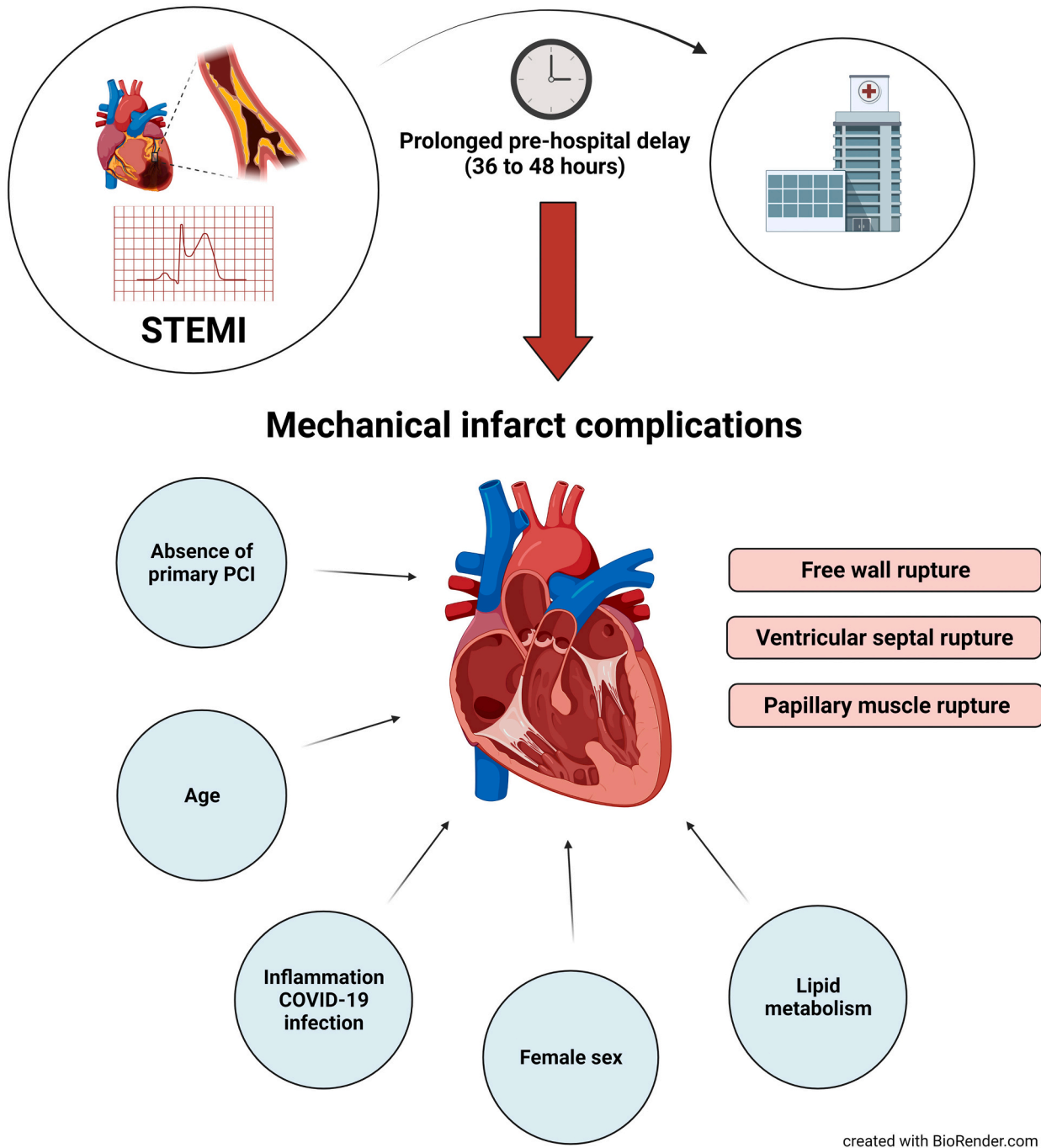


Fig. 1. Prolonged pre-hospital delay and mechanical infarct complications. COVID-19: coronavirus disease 2019; PCI: percutaneous coronary intervention; STEMI: ST-elevation myocardial infarction.

References

[1] A. Elbadawi, I.Y. Elgendy, K. Mahmoud, A.F. Barakat, A. Mentias, A.H. Mohamed, et al., Temporal trends and outcomes of mechanical complications in patients with acute myocardial infarction, *JACC Cardiovasc Interv.* 12 (18) (2019) 1825–1836.

[2] F. Bouisset, A. Deney, J. Ferrieres, V. Panagides, M. Becker, N. Riviere, et al., Mechanical complications in ST-elevation myocardial infarction: The impact of pre-hospital delay, *Int. J. Cardiol.* 345 (2021) 14–19, <https://doi.org/10.1016/j.ijcard.2021.10.020>. Epub 2021 Oct 23.

[3] G. Bonnet, V. Panagides, M. Becker, N. Riviere, C. Yvorel, A. Deney, et al., ST-segment elevation myocardial infarction: Management and association with prognosis during the COVID-19 pandemic in France, *Arch Cardiovasc Dis.* 114 (5) (2021) 340–351.

[4] I. Lechner, M. Reindl, C. Tiller, M. Holzknrecht, F. Troger, P. Fink, et al., Impact of COVID-19 pandemic restrictions on ST-segment elevation myocardial infarction: a cardiac MRI study, *Eur. Heart J.* (2021) ehab621, <https://doi.org/10.1093/eurheartj/ehab621>. Online ahead of print.

[5] B M, P S, RK B, A B, SJ R., Decline of acute coronary syndrome admissions in Austria since the outbreak of COVID-19: the pandemic response causes cardiac collateral damage, *Eur. Heart J.* 41 (19) (2020).

[6] S.J. Reinstadler, M. Reindl, I. Lechner, M. Holzknrecht, C. Tiller, F.X. Roithinger, et al., Effect of the COVID-19 pandemic on treatment delays in patients with ST-segment elevation myocardial infarction, *J. Clin. Med.* 9 (7) (2020).

[7] F.A. Choudry, S.M. Hamshere, K.S. Rathod, M.M. Akhtar, R.A. Archbold, O. P. Guttmann, et al., High thrombus burden in patients With COVID-19 presenting With ST-segment elevation myocardial infarction, *J. Am. Coll. Cardiol.* 76 (10) (2020) 1168–1176.

[8] M. Holzknrecht, M. Reindl, C. Tiller, I. Lechner, R. Perez Cabrera, A. Mayr, et al., Clinical risk score to predict early left ventricular thrombus after ST-segment elevation myocardial infarction, *JACC Cardiovasc. Imaging* 14 (1) (2020) 308–310, <https://doi.org/10.1016/j.jcmg.2020.07.033>.

- [9] G. Klug, H.J. Feistritzer, S.J. Reinstadler, M. Reindl, C. Tiller, M. Holzkecht, et al., Impact of posteromedial papillary muscle infarction on mitral regurgitation during ST-segment elevation myocardial infarction, *Int. J. Card. Imaging* 36 (3) (2020) 503–511.
- [10] H.D. Aronow, C. Bavishi, Mechanical complications in acute myocardial infarction: awaiting an ounce of prevention, *JACC Cardiovasc Interv.* 12 (18) (2019) 1837–1839.

Magdalena Holzkecht, Gert Klug, Bernhard Metzler, Sebastian
Johannes Reinstadler*
*University Clinic of Internal Medicine III, Cardiology and Angiology,
Medical University of Innsbruck, Anichstrasse 35, A-6020 Innsbruck,
Austria*

* Corresponding author.
E-mail address: sebastian.reinstadler@gmail.com (S.J. Reinstadler).