

Editorial



Extending the Golden Hour: Recognizing the Critical Timing for MINOCA Treatment

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Myocardial infarction with non-obstructive coronary arteries (MINOCA) represents a perplexing subset of acute myocardial infarction (AMI) that presents without significant stenosis in the coronary arteries.¹⁾ Despite the absence of major blockages, MINOCA patients can experience similar adverse outcomes as those with obstructive coronary disease.²⁾ In treating conventional AMI, the rapid restoration of coronary blood flow is critical. Many physicians refer to this period as the “golden hour,” emphasizing the importance of minimizing the duration of coronary artery occlusion through prompt reperfusion efforts to salvage myocardium.³⁾ Pre-hospital efforts are also crucial in achieving this goal. A critical factor influencing outcomes in AMI patients is the symptom-to-door time (SDT), the interval between symptom onset and hospital arrival. However, the applicability of this concept to MINOCA remains uncertain. Interestingly, there is emerging evidence suggesting that this concept may also be relevant to MINOCA.⁴⁾ In this editorial, we will explore the findings of a recent study that investigates the relationship between pre-hospital delay and long-term mortality in MINOCA patients, shedding light on the importance of timely medical intervention in this unique patient population.

HETEROGENEITY OF MINOCA AND THE IMPORTANCE OF EARLY TREATMENT

MINOCA is a heterogeneous condition encompassing various etiologies, including coronary artery spasm, spontaneous coronary artery dissection, plaque disruption, and microvascular dysfunction. The study highlighted the challenge of accurately classifying MINOCA due to the lack of detailed etiological information in the KAMIR-NIH/KAMIR-V registries, which limited the ability to fully capture the diverse causes of MINOCA.⁴⁾ Despite this limitation, the study found that early presenters exhibited higher proportions of coronary vasospasm, providing valuable insight into the disease’s complexity.

The importance of rapid reperfusion in AMI is well established, as acute coronary thromboembolism can lead to irreversible myocardial damage in a time-dependent manner. Most studies have shown that early presenters have better clinical outcomes, predominantly in patients with type 1 AMI.³⁾ However, even in the absence of significant coronary

Data Sharing Statement

The data generated in this study is available from the corresponding author upon reasonable request.

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obstruction, a substantial number of adverse events occur in MINOCA patients. Particularly in cases of coronary spasm, severe enough to cause MINOCA, significant myocardial damage could ensue. Early diagnosis and appropriate treatment can achieve reperfusion benefits, emphasizing the importance of promptly establishing the etiology.

For instance, an Italian institution conducted a study with MINOCA patients undergoing provocation tests, revealing that those with confirmed spasm experienced significantly more adverse clinical events.⁵⁾ When appropriately treated, the risk was notably reduced. This underscores the importance of early diagnosis and continuous appropriate treatment for patients, especially those with coronary spasm. Therefore, timely medical intervention from early identification of underlying causes in MINOCA patients are crucial, as they can significantly influence outcomes. Further research is needed to understand the diverse etiologies of MINOCA and optimize treatment strategies for this unique patient population.

The study revealed that late presenters had a significantly higher risk of 2-year all-cause mortality compared to early presenters. This finding underscores the critical importance of early hospital presentation in improving outcomes for MINOCA patients. The benefits of early initiation of therapeutic medications, such as renin-angiotensin-aldosterone system inhibitors and statins, have been well-documented in AMI settings.⁶⁾ Early treatment helps mitigate the adverse effects of myocardial infarction, limiting myocardial damage and improving cardiac function. The study found that early presenters had significantly higher levels of creatine kinase-MB, suggesting that early hospital arrival allowed for more timely intervention, reducing the extent of myocardial damage.

SOCIOECONOMIC FACTORS AND PRE-HOSPITAL DELAY

The study also emphasized that SDT not only reflects the time until medical treatment but also indicates broader socioeconomic factors, marital status, and other inequalities. The late presenters were older, had a higher proportion of women, and used EMS less frequently. Women and elderly patients often fail to recognize the symptoms of prodromal chest pain or have ambiguous symptoms, leading to delayed recognition of AMI.⁷⁾ Poor renal function is associated with silent AMI, which is more likely to cause late-onset AMI. Therefore, poor renal function is independently related to delayed presentation in MINOCA patients. This poor renal function is often associated with poor risk factor control, posing a greater threat to vulnerable populations.

These factors independently influence cardiovascular outcomes in patients with established coronary artery disease. The lower utilization of emergency medical services (EMS) among late presenters highlights the need for increased awareness and better access to EMS, especially in socioeconomically disadvantaged populations. Addressing these disparities is crucial for improving pre-hospital care and outcomes in MINOCA patients.

METHODOLOGICAL LIMITATIONS AND FUTURE DIRECTIONS

The study acknowledges several methodological limitations, including potential selection bias inherent in observational cohort data and the retrospective identification of MINOCA

based on registry data without prospective diagnostic confirmation. Additionally, the lack of detailed imaging or functional assessment data meant that some patients with other conditions mimicking MINOCA might have been included, potentially skewing results. Moreover, the time required to accurately diagnose MINOCA and identify its underlying causes likely varies significantly between institutions and treating physicians and may be considerable. Despite these limitations, the study provides valuable insights and highlights the need for further clinical investigations to elucidate cardiovascular outcomes associated with different hospital presentation strategies for MINOCA patients. Future research should explore systematic approaches based on the latest guidelines to minimize diagnostic time and improve clinical outcomes.

The findings from this study reinforce the importance of reducing pre-hospital delays to improve clinical outcomes in MINOCA patients. Healthcare providers should focus on educating patients about the importance of early symptom recognition and timely hospital visits. Policymakers should consider strategies to enhance EMS, particularly in underserved areas, to ensure rapid access to care. Additionally, there is a need to investigate how systematic, guideline-based approaches can reduce the time taken to diagnose and treat MINOCA, potentially improving patient outcomes. By addressing these critical factors, we can better understand and manage MINOCA, ultimately improving patient outcomes and extending the golden hour for all myocardial infarction patients.

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