News Release

Door-to-Unload Time and Mortality in Patients with ST-Segment Elevation Myocardial Infarction complicated by Cardiogenic Shock

Key Points

- In a nationwide registry of 1,783 patients with STEMI-CS treated with microaxial flow pump (mAFP), shorter door-to-unload time was associated with lower in-hospital mortality.
- Prolonged delays were more common in older patients, those with organ dysfunction, prior IABP or VA-ECMO use, PCI before mAFP placement, and treatment at lower-volume centers.
- Door-to-unload time may serve as a practical process metric, and mAFP placement within 90 minutes of hospital arrival may be a feasible target once cardiogenic shock is recognized.

Summary

A research group led by Shin Nagai, a graduate student in the Department of Cardiology, Nagoya University Graduate School of Medicine; Toru Kondo, Lecturer at the Center for Advanced Heart Failure, Nagoya University Hospital; Masato Mutsuga, Professor in the Department of Cardiac Surgery, Nagoya University Graduate School of Medicine; and Toyoaki Murohara, former Professor in the Department of Cardiology, Nagoya University Graduate School of Medicine, analyzed data from a nationwide registry to show that shorter time from hospital arrival to placement of a microaxial flow pump (mAFP) was associated with lower in-hospital mortality in patients with ST-segment elevation myocardial infarction complicated by cardiogenic shock.

ST-segment elevation myocardial infarction is a serious condition caused by sudden blockage of a coronary artery, which supplies oxygen and nutrients to the heart. Approximately 10% of patients develop cardiogenic shock, in which the heart cannot pump enough blood to the body, and mortality is reported to be as high as 30–50%. Shortening the time from hospital arrival to catheter-based reopening of the blocked artery, known as door-to-balloon time, has long been emphasized in acute myocardial infarction care. However, mortality remains high in patients complicated by cardiogenic shock, highlighting the need for additional treatment strategies.

A microaxial flow pump is a catheter-based medical device inserted through a blood vessel, such as the femoral artery, to temporarily assist the pumping function of the failing heart. It has been available for clinical use in Japan since 2017, and recent studies have reported its effectiveness in patients with ST-segment elevation myocardial infarction complicated by cardiogenic shock. However, the association between the time from hospital arrival to mAFP placement, known as door-to-unload time, and clinical outcomes has not been fully clarified.

In this study, the researchers analyzed data from 1,783 patients registered in a nationwide registry. They found that shorter door-to-unload time was associated with lower in-hospital mortality. In particular, compared with patients who underwent mAFP placement within 60 minutes after hospital arrival, those who underwent placement after 150 minutes had an approximately 15% higher in-hospital mortality rate. These findings suggest that door-to-unload time may serve as a process metric for evaluating and improving the quality of care in patients with ST-segment elevation myocardial infarction complicated by cardiogenic shock.

These findings were published in the international journal EuroIntervention on 15 June, 2026.

Research Background

ST-segment elevation myocardial infarction (STEMI) is a life-threatening condition caused by sudden blockage of a coronary artery. Approximately 10% of patients with STEMI develop cardiogenic shock, in which the heart cannot pump enough blood to the body, and mortality remains as high as 30–50%. Although shortening the time from hospital arrival to reopening of the blocked artery by percutaneous coronary intervention (PCI), known as door-to-balloon time, has improved STEMI care, outcomes remain poor in patients with cardiogenic shock. This highlights the need for treatment strategies beyond rapid reperfusion alone.

A microaxial flow pump (mAFP) is a catheter-based mechanical circulatory support device that assists the heart. A recent study showed that adding mAFP support to standard therapy improve outcomes in patients with STEMI complicated by cardiogenic shock. However, the clinical significance of the time from hospital arrival to mAFP placement, known as door-to-unload time, has not

been fully clarified. This study examined whether shorter door-to-unload time was associated with lower in-hospital mortality using a nationwide registry in Japan.

Research Results

This study analyzed 1,783 patients with STEMI complicated by cardiogenic shock who underwent mAFP placement enrolled in the Japan Registry for Percutaneous Ventricular Assist Devices (J-PVAD). The median door-to-unload time was 99 minutes, and 698 patients (39.2%) died during hospitalization. In-hospital mortality was 32.9% in the ≤60-minute group, 33.0% in the 61–90-minute group, 40.1% in the 91–150-minute group, and 48.3% in the >150-minute group. Even after adjustment for clinically relevant factors, longer door-to-unload time remained associated with higher in-hospital mortality. In nonlinear analysis, mortality remained relatively stable during the first 90 minutes after hospital arrival and then increased with longer delays (Figure 1). Older age, lower annual institutional mAFP volume, higher heart rate, higher creatinine levels, prior use of an intra-aortic balloon pump or VA-ECMO, and PCI before mAFP placement were associated with longer door-to-unload time.

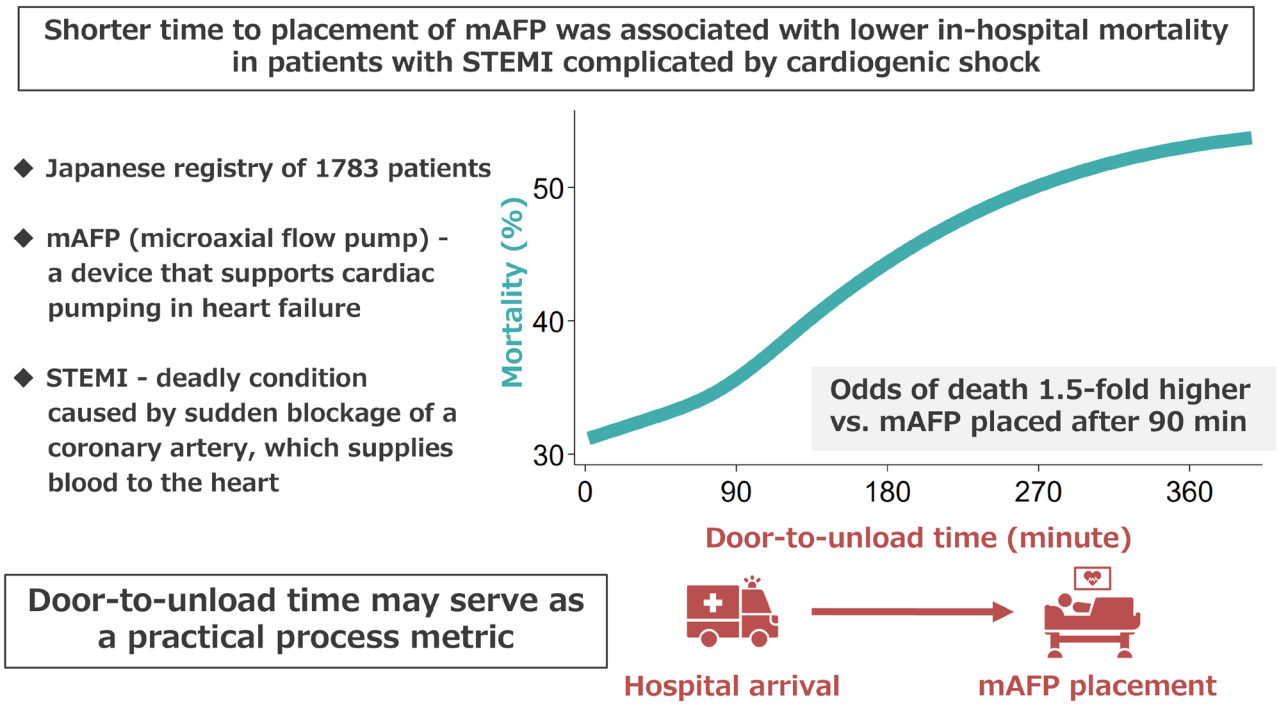

Figure 1:Door-to-unload time and in-hospital mortality in patients with STEMI complicated with cardiogenic shock

Research Summary and Future Perspective

Using a nationwide registry of more than 1,700 patients, this study showed that shorter door-to-unload time was associated with lower in-hospital mortality in patients with STEMI complicated by cardiogenic shock who underwent mAFP support.

Door-to-unload time may serve as a complementary process metric alongside the established door-to-balloon time in the care of patients with STEMI complicated by cardiogenic shock. Achieving door-to-unloading within 90 minutes, by rapid preparation for mAFP placement, coordinated care pathways, and collaboration with experienced shock centers may help improve the quality of care for these patients.

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