

Left ventricular thrombus formation after reperfused ST-segment elevation myocardial infarction: Insights from cardiac magnetic resonance imaging

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Background

Left ventricular (LV) thrombus formation is a common complication in patients with recent ST-elevation myocardial infarction (STEMI) and occurs in approximately 6% in the early phase after primary percutaneous coronary intervention (PCI)(1). LV thrombi were found to independently predict future cardiovascular events (2, 3) and are potentially preventable through early recognition and prompt treatment initiation (4).

Cardiac magnetic resonance (CMR) represents the optimal modality for the diagnosis of LV thrombus (5). However, CMR imaging is currently not integrated into routine STEMI aftercare. Consequently, better knowledge about main factors influencing LV thrombus formation is warranted.

The present project therefore aimed to (a) assess the prevalence of LV thrombus formation in contemporary re-perfused STEMI patients as detected by CMR imaging, (b) compare the diagnostic accuracy of CMR versus transthoracic echocardiography, and (c) investigate potential determinants of LV thrombus formation.

Research progress: In this project, of 628 consecutive STEMI patients, 556 patients were included in final analysis. Median age of the study population was 57 [50-66] years and 17% were females. CMR was performed at a median of 3 [IQR: 2-4] days, and transthoracic echocardiography (TTE) was conducted at a median of 3 [IQR: 2-4] days after PCI. LV thrombus was detected in 22 patients (4%) using CMR and in 12 patients (2.2%) using TTE. LV thrombi were observed only apically and all echocardiographically evident thrombi were detected on CMR. The presence of LV thrombi was associated with a larger IS ($p<0.001$) and higher rates as well as larger MVO ($p=0.041$ and $p<0.001$, respectively). Moreover, patients with LV thrombi had significantly lower LV ejection (LVEF) fraction and larger LV end-diastolic volumes as well as larger LV end-systolic volumes (all $p<0.001$). All patients with LV thrombus had left anterior descending as the culprit vessel. To further evaluate main factors influencing LV thrombus formation and potentially predict LV thrombi, a weighted risk score using multi-variable associates of LV thrombus formation (TTE determined LV EF, LAD as culprit lesion, peak high-sensitivity cardiac troponin T and peak high-sensitivity C-reactive protein) was conducted. The sensitivity and the specificity of the risk score were 91% and 80%, respectively.

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Outlook:

It is now well established from a variety of studies that systemic inflammation, as measured by high-sensitivity C-reactive protein, is a strong predictor of LV thrombi (7). To date, research on the subject has been mostly restricted to this single inflammatory

marker. Hence, as one next step we are currently evaluating the association of different inflammatory makers with LV thrombus formation. We will compare the strength of the associations with LV thrombus formation and compare their predictive value. This might be useful to establish new treatment strategies and further optimize secondary prevention. In a further project we will now evaluate novel echocardiographic predictors for LV thrombus formation such as the apical wall motion score (AWMS). This project will provide further insights into the value of echocardiography as a gatekeeper for CMR in patients with high LV thrombus risk.

References

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