Point-of-care biomarkers of thrombotic status predict spontaneous reperfusion in ST-segment elevation MI and clinical outcomes

R. Kanji1, Y.X. Gue2, V. Memtsas1, N.H. Spencer3, D.A. Gorog1

1National Heart and Lung Institute, London, United Kingdom of Great Britain & Northern Ireland
2 University of Liverpool, Liverpool Centre for Cardiovascular Science, Liverpool, United Kingdom of Great Britain & Northern Ireland
3 University Of Hertfordshire, Hatfield, United Kingdom of Great Britain & Northern Ireland

Funding Acknowledgements: None.

Background: Spontaneous reperfusion, seen in ~20% of patients with ST-segment elevation myocardial infarction (STEMI), manifests as normal epicardial flow in the infarct-related artery (IRA), with or without ST-segment resolution, before percutaneous coronary intervention (PCI). The drivers mediating this are unknown.

Purpose: We aimed to assess whether the thrombotic profile of patients with and without spontaneous reperfusion differed significantly, and whether such patients had better outcomes.

Methods: We performed a prospective, observational study in consecutive patients presenting with STEMI. Blood samples were taken from a 6 Fr arterial sheath immediately before emergency angiography, before PPCI, after dual antiplatelet therapy loading, but before the administration of heparin or other anticoagulant. Blood samples were tested using a point-of-care global test of thrombotic status, measuring occlusion (OT) and endogenous fibrinolysis (LT) times. Spontaneous reperfusion was defined as IRA TIMI III flow pre-PCI. Patients were followed for major cardiovascular events (MACE; death, myocardial infarction, stroke).

Results: Spontaneous reperfusion was associated with longer OT (435s vs. 366s, p<0.001) and shorter LT (1257s vs. 1616s, p<0.001), lower troponin and better LV function. LT was superior to OT for predicting spontaneous reperfusion (AUC for LT: 0.707, 95% CI 0.661-0.753; AUC for OT: 0.629, 95% CI 0.581-0.677). Amongst patients with spontaneous reperfusion, those with complete, versus partial ST-segment resolution, had longer OT (p=0.002) and shorter LT (p<0.001). Spontaneous reperfusion was unrelated to clinical characteristics or pain-to-angiography times.

Over 4-years, patients with spontaneous reperfusion experienced fewer MACE than those without (4.1% vs. 10.6%, p=0.013), especially in those with both spontaneous reperfusion and complete ST-segment resolution (1.5% vs. 10.1%, p=0.029).

Conclusions: We demonstrate a novel haematological signature in STEMI patients with spontaneous reperfusion, namely reduced platelet reactivity and faster endogenous fibrinolysis, relating to smaller infarcts and improved survival. This indicates a role for modulating thrombotic status early following STEMI-onset, to facilitate spontaneous reperfusion and improve outcomes.
STEMI

Pre-PCI flow
TIMI < III
No ECG resolution

Pre-PCI ECG
TIMI III
No or partial ECG resolution
TIMI III
Complete ECG resolution

Occlusion time in vitro

Lysis time in vitro

Infarct size

MACE at 4 years
10.6%
4.1%
1.5%
P=0.029
P=0.013

Visual abstract
Thrombotic profile predicts outcome