Plasma exosomes reflect myocardial injury detected by cardiac magnetic resonance in STEMI patients

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Background: Cardiac magnetic resonance (CMR) is the gold standard technique to detect microvascular obstruction (MVO) and myocardial salvage index (MSI) in patients with ST-segment elevation myocardial infarction (STEMI) treated by primary percutaneous coronary intervention (pPCI). Exosomes are lipid vesicles released by all cells that reflect the metabolic status of the releasing cells, thus representing potential biomarkers of disease. The aim of this study is to evaluate the correlation between exosome profile and myocardial infarction characteristics as detected by CMR in patients after STEMI.

Methods: Exosomes were isolated from plasma of 42 patients by different commercial kits, their concentration and size distribution determined by Nanoparticle Tracking Analysis, exosomal surface epitopes by the MACSPlex Exosome Kit and GPIIb-IIIa expression by ELISA kit. Data obtained were correlated with parameters of myocardial damage (STEMI location, culprit lesion, time to revascularization, MVO and MSI).

Results: Levels of circulating plasma exosomes were higher in patients with anterior STEMI (p = 0.0002) and when the culprit lesion was located in LAD (p = 0.045). In addition, a high number of exosomes was measured in the subset of patients who underwent a late revascularization (> 3 h from onset of symptoms; p = 0.038). Patients with MVO and low MSI (< 0.5) have smaller exosome (p = 0.0015 and p = 0.014, respectively). By analysing the expression of 37 surface protein markers, the strongest signals are platelet specific markers (CD41b and CD42a) followed by endothelial and immune cells markers. Interestingly, a lower expression of platelet marker GPIIb-IIIa was detected in both patients with MVO and anterior STEMI (p = 0.039 and p = 0.0038, respectively). Univariate analysis demonstrated that exosome size and GPIIb-IIIa were independent predictors of MVO/MSI and ROC analysis demonstrated that dimension and GPIIb-IIIa can identify patients with MVO/MSI (AUC 0.75 and 0.71, respectively).

Conclusion: The plasma exosome profile well reflects CMR-assessed myocardial injury after STEMI. In particular, the exosome dimension and the expression of platelet marker GPIIb-IIIa are independently associated with MVO. Future studies with larger populations are required to confirm the role of platelet-derived exosomes in risk stratification after STEMI.
Unfavourable CMR and sEV profile
Favourable CMR and sEV profile