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Culprit vessel related myocardial mechanics and prognostic implications following acute myocardial infarction

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Background: Prognosis in acute myocardial infarction (AMI) depends on the amount of infarct related artery (IRA) subtended myocardium and associated damage but has not been described in great detail. Consequently, we sought to describe IRA associated pathophysiological consequences using cardiac magnetic resonance (CMR).

Methods: 1235 AMI patients (n=795 ST-elevation (STEMI) and 440 non-STEMI) underwent CMR following percutaneous coronary intervention. Blinded core-laboratory data were compared according to left anterior descending (LAD), left circumflex (LCx) and right coronary artery (RCA) regarding major adverse clinical events (MACE) within 12 months. Left ventricular (LV) global longitudinal/circumferential/radial (GLS/GCS/GRS) as well as left atrial (LA) total (ϵs), passive (ϵe) and active (ϵa) strains were determined using CMR-feature tracking. Tissue characterisation included infarct size (IS) and microvascular obstruction.

Results: LAD and LCx were associated with higher mortality compared to RCA lesions (4.6% and 4.4% vs 1.6%). LAD lesions showed largest IS (16.8%), largest ventricular (LV ejection fraction (EF) 47.4%, GLS –13.2%, GCS –20.8%) and atrial (ϵs 20.2%) impairment. There was less impairment in LCx (IS 11.8%, LVEF 50.8%, GLS –17.4%, GCS –25.0%, ϵs 20.7%) followed by RCA lesions (IS 11.3%, LVEF 50.8%, GLS –19.1%, GCS –26.6%, ϵs 21.7%). In AUC analyses ϵs (LAD, RCA) and GLS (LCx) best predicted MACE (AUC$>$0.69). Multivariate analyses identified ϵs (p=0.017) in LAD and GLS (p=0.034) in LCx infarcts as independent predictors of MACE.

Conclusions: CMR allows IRA specific phenotyping and characterisation of morphologic and functional changes. These alterations carry infarct specific prognostic implications and may represent novel diagnostic and therapeutic targets following AMI.