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PREVALENCE AND EXTENT OF INFARCT AND MICROVASCULAR OBSTRUCTION FOLLOWING A RANGE OF REPERFUSION TECHNIQUES IN ST-ELEVATION MYOCARDIAL INFARCTION (STEMI)

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Introduction Cardiac MRI (CMR) provides unique characterisation of myocardial injury post acute STEMI. It is the gold standard for non-invasive measurement of Infarct Size (IS) and tissue perfusion during STEMI. Microvascular obstruction (MVO) describes suboptimal tissue perfusion despite restoration of flow in the infarct-related artery (IRA). IS and MVO are independent predictors of adverse remodelling and prognosis post STEMI. MVO is generally assumed to be related primarily to reperfusion. CMR extent of IS and MVO decreases after 48 h post STEMI. There is a dearth of data on the prevalence and extent of MVO in clinical practice using different reperfusion methods, in particular in those without reperfusion. We hypothesise that the extent and presence of MVO are primarily related to the extent of ischaemic injury rather than reperfusion injury.

Method 94 acute STEMI subjects were studied. 75 were prospectively recruited into a study of ventricular remodelling post STEMI. 19 subjects were routine clinical CMR examinations undertaken in

Table 1 Key demographics and CMR analyses in the early reperfused and non-reperfused patients

Variable	Total study group (n=94)	Early reperfused (PPCI+lysis, n=59)	Non-reperfused (n=21)	P Value
Age (years)	61.01±13.1	60.24±11.90	65.57±16.18	0.114
Male sex (%)	82 (87.2)	53 (89.8)	16 (76.2)	0.121
Diabetes mellitus (n, %)	9 (9.6)	3 (5.1)	6 (28.6)	0.004
Time from admission-CMR (days)	2.22 (1.24–3.79)	1.91 (1.16–2.58)	6.59 (4.77–10.97)	<0.001
LVEDVI (ml/m2)	94.21 (85.55–110.98)	90.68 (82.38–102.72)	98.04 (88.12–124.97)	0.013
LVESVI (ml/m2)	55.56 (48.08–69.93)	51.35 (45.37–62.62)	61.09 (53.97–83.64)	0.004
EF (%)	39.85±9.39	42.30±7.80	35.02±11.30	0.002
IS (% LV mass)	25.41±18.37	18.85±12.65	23.07±11.37	0.181
MVO (% LV mass)	0.60 (0.00–3.10)	0.44 (0.00–2.92)	1.34 (0.00–2.79)	0.364

Mean±SD where normally distributed.

non-reperfused, late-presenting patients (>12 h symptoms) to assess viability. Subjects were assessed on a Siemens Avanto 1.5T system. LV function and volumes were assessed using SSFP. Ten minutes after intravenous injection of gadolinium contrast (0.2 mmol/kg), delayed contrast-enhanced images were acquired using a segmented inversion-recovery gradient-echo sequence. IS was defined as areas of hyperenhancement with signal intensity (SI) >50% of peak SI in the infarct core (Full-Width Half-Maximum technique). MVO was defined as hypointensity within areas of infarct.

Independent T Test and Mann-Whitney U Test analyses were used for normally and non-parametrically distributed data respectively. Statistical significance was taken at $p<0.05$.

Results There was no significant difference in age, sex, prevalence of angina, proportion of STEMI with left anterior descending artery IRA, TIMI score or Rentrop (degree of collateralization) score in early reperfused (PCI or Thrombolysis <12 h of symptoms, n=59) and non-reperfused patients (n=21) (table 1, below). Diabetes mellitus was more prevalent in non-reperfused patients ($p=0.004$). LV volumes were significantly greater and ejection fraction (LVEF) was significantly lower in non-reperfused patients. Despite a longer time from admission to CMR ($p<0.001$), there was a trend towards greater IS and extent of MVO in non-reperfused patients. Of the 15 non-reperfused patients who had angiography, the absence of spontaneous reperfusion was confirmed in 67% (TIMI flow 0–1). χ^2 Analysis showed a trend towards higher prevalence of MVO in non-reperfused STEMI (71.4% vs 55.2%). Late PCI patients (n=6) demonstrated a trend towards higher volumes and greater extent of IS and MVO compared with non-reperfused and rescue PCI (n=8) patients. No differences were seen between rescue PCI and non-reperfused patients.

Conclusions The prevalence and extent of myocardial and microvascular injury (IS, MVO) on CMR in non-reperfused STEMI is at least as much as that occurring in those undergoing early reperfusion therapy. This is despite a significantly longer time to CMR in non-reperfused patients, which would be expected to result in a reduction in IS and MVO. MVO is not exclusive to reperfusion and may represent the degree of ischaemic injury.

Median (25th–75th quartiles) where non-normally distributed.

Total study group (n=94) consists of early reperfused, non-reperfused, late PCI and rescue PCI patients.