Electrocardiographic prediction of extensive lateral involvement in acute non-anterior wall myocardial infarction

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Abstract

Introduction: Recent research has shown the importance of the height, surface and R/S ratio of R waves in lead V1 and the height of R in V6 for estimating the extent of lateral wall involvement in chronic non-anterior wall myocardial infarction (MI) as assessed by cardiac magnetic resonance imaging. In the mentioned study the R waves were found to be quantitatively related to lateral wall involvement. Hence a correlation between acute ST-deviation and late R wave development could identify lateral wall ischemia and subsequent late extent of lateral infarction.

Purpose: The objective of this study was to investigate the correlation between the degree of ST-deviation in V1, V2 and in V6 as recorded in the acute phase with the surface, height and R/S ratio in V1 and the height of R waves in V6 in the chronic phase in non-anterior wall infarction.

Methods: The same Maastricht ST elevation infarction (MAST) database was used as in reference 1. In the subgroup presenting with non-anterior wall MI the ECG's taken at the emergency room before PCI were selected showing the most prominent ST deviation. ST-deviation was measured at the J-point after 8 times magnification. The amount of ST deviation was related to the extent of R wave formation as reported in reference 1.

Results: Of a total of 106 patients with STEMI 69 patients (47 male, 22 female) with a mean age of 59,5 years (SD 10,5) diagnosed with non-anterior wall MI were studied. Of those 59 (85,5%) presented with RCA occlusion and 10 (14,5%) with LCx as the culprit vessel. 63 (91,3%) had a smoking history, 5 patients had diabetes mellitus and 23 had hypertension (33,3%). The study ECG was recorded on average 2:10h (SD 1:07h) after the onset of the coronary complaints. 48 patients (69,5%) had thrombolysis in myocardial infarction (TIMI) flow grade 0 to 1 before PCI, and TIMI 3 was established in 59 (85,5%). The most important correlations are displayed in table 1. The best correlation showed ST elevation in V6 with R/S in V1 (B= 0,510, R= 0,909 and p= 0,002) in LCx occlusion. No correlation was found between the surface and height of R in V1 with ST-segment deviation in the acute phase.

	R/S V1			*R height V6*		
	B	R	p	B	R	p
ST depression V1	0.225	0.447	0.001	-1.916	0.328	0.024
ST deviation V6	0.200	0.579	<0.00001	-1.660	0.408	0.003
ST elevation V6	0.402	0.780	<0.00001	-2.273	0.448	0.022

Table 1. Correlation between ST-segment deviation, depression and elevation in the acute phase and R-waves in the chronic phase of non-anterior MI.

Investigating a subgroup of mid and distal RCA occlusion together with LCx as the culprit vessel (table 2) improved correlations with deviation in V1 and V6 and R/S in V1.

	R/S V1			*R height V6*		
	B	R	p	B	R	p
ST depression V1 RCA (without prox) & LCx	0.251	0.493	0.005	-2.356	0.451	0.012
ST deviation V6 RCA (without prox) & LCx	-0.193	0.385	0.027	2.169	0.427	0.016
ST deviation V6 RCA (without prox) & LCx	0.263	0.688	<0.00001	-1.790	0.446	0.012
ST elevation V6 RCA (without prox) & LCx	0.444	0.782	0.001	2.257	0.205	0.205

Table 2. Correlations displaying RCA and LCx without proximal RCA occlusions with R/S V1 and R height V6.

Discussion: The high correlation between ST-deviation in V6 and the extent of R waves could be explained by the manner the positive pole of V6 is facing directly onto the lateral wall and alongside the right ventricle giving the most precise information about the lateral wall. Right ventricular infarction, common in proximal RCA occlusions, is thought to counterbalance lateral involvement in some cases, thus concealing the lateral ischemia. Further statistical analysis, such as multiple regression analysis correcting for potential confounders is part of ongoing research. The estimations and conclusions displayed have to be regarded as early results.

(Early) Conclusions: Both ST-depression in V1 and ST-elevation in V6 correlate strongly with R/S in V1 and the height of R in V6 indicating lateral ischemia and giving an estimation of the extent of late lateral wall infarction.