Capability of the criteria in the Sclarovsky-Birnbaum Ischemia Grading System to reflect the severity of myocardial ischemia – A study design

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Background

Current guidelines for management of patients with ST-segment elevation myocardial infarction (STEMI) recommend primary percutaneous coronary intervention (PCI) as reperfusion strategy over fibrinolysis if performed within 120 minutes of first medical contact. In addition to the ST segment, analysis of the QRS complex may potentially identify patients with rapid progression of myocardial infarction with need of a different treatment strategy, since severe ischemia results in regional slowing of ventricular depolarization, thus distorting the terminal part of the QRS complex. The Sclarovsky-Birnbaum (SB) ischemia grading system, which considers T wave, ST and QRS complex changes, correlates with final infarct size, failure of ST segment resolution and mortality. However, the pathophysiologic basis for the distinction between the grades of ischemia is not fully understood. There are two distinct definitions of terminal QRS distortion depending on the presumed waveforms of the pre-ischemic ECG recording. One of these (disappearance of S waves) is indeed a manifestation of slowed ventricular depolarization. However, the other (J point/R wave > 0.5) is not such a clear manifestation hereof.

Study population

Retrospective study of STAFF III, which included patients with stable angina pectoris who received prolonged balloon PCI (mean: 4.4 minutes). Before, during and after the balloon-induced myocardial ischemia, continuous 12 lead ECG recording was performed. In a subset of patients ^{99m}Tc-sestamibi was administered during the occlusion followed by myocardial scintigraphy to quantitate loss of myocardial perfusion. This study population provides a unique opportunity for studying the first few minutes of myocardial ischemia and the effect on the ECG.

Aims and hypothesis

The aims of the study are to 1) test the association between SB grades of ischemia and other QRS complex indices shown to correlate with severity of ischemia (ΔR-/S-wave amplitude, ΔQRS slope) and to 2) test the association between grades of ischemia and hypoperfusion quantified by myocardial scintigraphy. It is hypothesized that the criterion 'absence of S-wave' is more closely associated with 1) changes of QRS-complex indices as well as with 2) myocardial hypoperfusion, than the criterion 'J point/R-wave > 0.5' both at present used to define terminal QRS distortion in the SB ischemia grading.