Identification of the extent, severity and spatial location of acute myocardial ischemia by T wave amplitude analysis

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Background: ST deviation has been traditionally used to evaluate the severity of myocardial ischemia (MI) and the occlusion site. Although previous studies have also focused on the morphology of the T wave, we hypothesized that characterization of T wave amplitude (Ta) could improve ischemia detection and contribute to the identification of the occluded artery.

Methods: 12-lead ECGs from 102 patients undergoing prolonged percutaneous coronary intervention (PCI, 4.7±1.3 min) due to stable angina pectoris were used to derive Ta. The total amount of change in Ta at the end of PCI, denoted as ΔTa, was computed for each patient and lead. The distribution of occluded arteries was: LAD, 34; LCX, 21; and RCA, 47. Measurements of ischemia extent and severity were obtained from myocardial scintigraphic imaging in a subset of 35 patients (11 with and 24 without previous MI).

Results: Ta was highly sensitive to detect PCI-induced changes, with mean ΔTa over leads ranging from 21.4 to 241.2 μV and maximum ΔTa from 58.0 to 818.8 μV. Mean ΔTa was significantly correlated with both ischemia extent ($r=0.55$, $p<0.05$) and severity ($r=0.67$, $p<0.05$), with such correlation being stronger than for mean ΔST deviation ($r=0.52$ and $r=0.63$). The strength of the relationship between ΔTa and ischemia extent/severity was greater in patients with vs without prior MI ($r=0.82$ vs 0.48/$r=0.79$ vs 0.64). Additionally, ΔTa presented a distinctive lead profile as a function of the occlusion site, with the largest changes in V2-V4 for LAD occlusions, II, III and aVF for RCA and V2, V3 and III for LCX.

Conclusion: Ta shows high sensitivity to identify the extent and severity of PCI-induced ischemia, outperforming ST deviation. The spatial distribution of Ta can help to locate the occluded artery.