How to interpret ST deviations in serial vectorcardiographic ischemia detection?

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INTRODUCTION Guidelines recommend comparison of acute ECGs with earlier made non-ischemic ECGs. But how should they be compared? Even the most experienced cardiologists can have difficulties comparing by just looking at them. An ECG can contain several leads with elevations and other with depressions, making actual ST amplitude interpretation difficult. Moreover, due to preexisting non-zero ST segments interpretation of the actual ischemic change can be hampered. Therefore, we aim at using a difference vector in ischemia detection. For this analysis two questions should be answered: on what point should the two ECGs be synchronized? and: where in time with respect to the synchronization point should the ischemia amplitude be measured?

In current practice comparison is done at the J point, hoped that this reflects the diastolic and systolic injury currents the purest. Locating the J point can be difficult. A J point often rests on the visual assessment of an inflection point in one lead which makes it less reliable. An additional disadvantage could be the difference in QJ intervals between the two ECGs, thereby comparing nonischemic and ischemic J point amplitudes at different times in the heart cycle. Alternative synchronization points could be the minimal vector magnitude or onset QRS. However, still the question stands at what time with respect to the synchronization point ST amplitudes should be measured.

In our current study we explore the impact of the choice of a synchronization point and of the choice of timing of the ST measurement with respect to the synchronization point on differential ischemia detection.

METHODS We analyzed 82 patients of the STAFF III database who underwent elective PTCA. We compared in each patient a non-ischemic reference ECG made prior to the procedure with an ischemic ECG made after three minutes of balloon occlusion. Vectorcardiograms were synthesized and onset QRS and the J point were interactively determined with our LEADS program. Difference vectors were computed over a wide time interval surrounding the synchronization points.

RESULTS

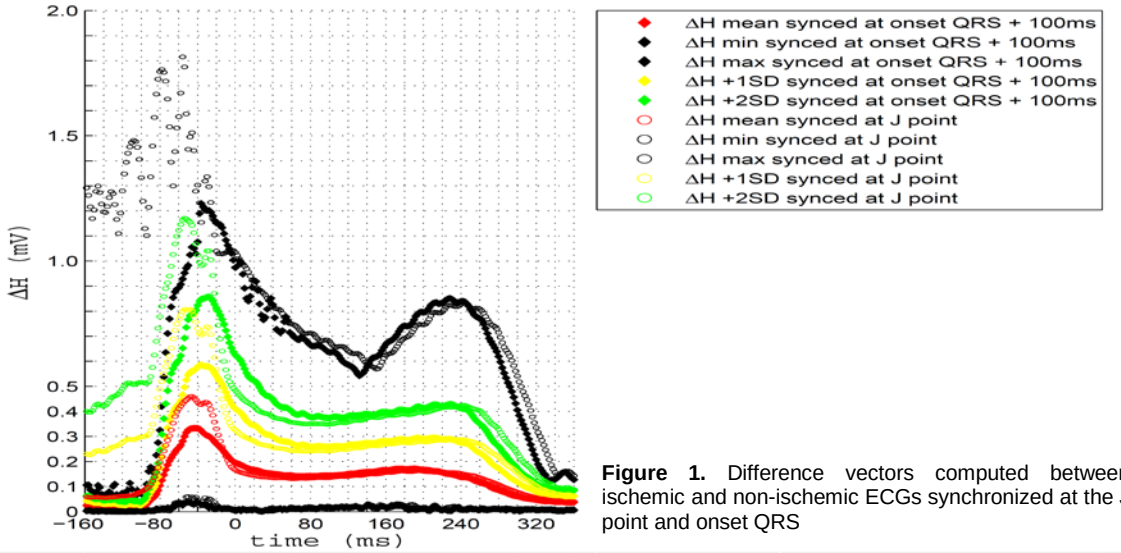

Figure 1. Difference vectors computed between ischemic and non-ischemic ECGs synchronized at the J point and onset QRS

DISCUSSION From the results can be concluded that synchronizing at a fixed (onset QRS) or variable (J point) time interval makes almost no difference for the difference vector amplitude. Furthermore, the difference vectors stay somewhat stable over a long trajectory starting about 60 ms after the synchronization point. Therefore, it does not seem to matter where to measure to ischemia, as long as it is been measured well after the synchronization point.