More is worse — ST-segment deviation in unstable coronary artery disease

See page 1166 (issue 16) for the article to which this Editorial refers

Unstable coronary artery disease encompasses a heterogeneous group of patients with a variable clinical background, different severity of the underlying coronary artery disease, large variation in clinical course and variable risk of subsequent cardiac events. Therefore, an early evaluation of possible underlying mechanisms and an assessment of the prognosis are important in an attempt to tailor the treatment to the individual patient. Among the variety of indicators that have been suggested for these purposes, the resting 12-lead ECG holds a unique position: it is easily obtained, universally available, inexpensive and provides important diagnostic and prognostic information.

In unstable coronary artery disease ST-segment deviations in the admission ECG carry a higher risk for subsequent cardiac events than isolated T-wave inversions. A normal ECG generally indicates a favourable prognosis. In a recent study of patients with unstable coronary artery disease the 30-day rate of death from myocardial infarction was 5, 6, 6 and 15% in those with no ST-T changes, isolated T-wave inversion, minor ST-segment elevation and ST-segment depression, respectively\[1\]. However, it must be recognized that ‘T-wave inversion’ may range from deep symmetrical anterior T-wave inversion highly indicative of a proximal stenosis of the left anterior descending coronary artery, to unspecified minor T-wave inversion or flattening. Furthermore, the number, location and amount of ST-segment deviation yields prognostic information, for example the risk of death or myocardial infarction increases in correspondence with the amount of ST-segment depression\[1].

However, the ECG at rest does not adequately reflect the dynamic nature of coronary thrombosis and myocardial ischaemia. As many as two thirds of all ischaemic episodes in unstable coronary artery disease are silent, that is they are not associated with chest pain. Thus, even using repeated ECGs in conjunction with chest pain, most episodes of ischaemia will be overlooked. Therefore, different technologies for continuous monitoring of the ST-segment, such as Holter monitoring, continuous vectorcardiography and continuous 12-lead ECG monitoring have been introduced, the two latter techniques with capacity for on-line presentation. In continuous vectography, the ST-vector magnitude, the sum of ST-segment deviation in the three orthogonal leads X, Y and Z, is the one used most commonly to monitor ST-segments. Previous studies evaluating the prognostic value of these techniques have focused on the number and total duration of episodes of ST-segment deviation. In these studies, 15–30% of unstable...
coronary artery disease patients have had at least one episode of ST-segment deviation during the first 24 h after admission. In one study using Holter monitoring the in-hospital rate of death from myocardial infarction in patients with and without ST episodes was 19 and 2%, respectively[2], and in another study using continuous vectography the 1 year rate was 23 and 10%, respectively[3]. In both these studies, ST-monitoring added independent prognostic information to the 12-lead ECG at rest, and the usual clinical parameters in multivariate analysis. However, in a recent published study, the additive prognostic value of identifying ST vector magnitude episodes was confined in patients without ST-segment depression in their admission ECG[4].

In the study reported in issue 16 (pp. 1166–1174), Abrahamsson and co-workers compared the prognostic value of several different vectorcardiographic parameter derived from trend curves in patients admitted with unstable coronary artery disease[3]. Among the parameters evaluated, the maximum ST vector magnitude level was the strongest predictor of death or myocardial infarction, stronger than the number of ST vector magnitude or STC vector magnitude episodes and the area under the ST vector magnitude trend curve. During the 1 year follow-up, 8 and 32% died or suffered a myocardial infarction among those with a maximum ST vector magnitude of <144 µV and ≥144 µV, respectively. In multivariate analysis of different risk markers and demographic data, the maximum ST vector magnitude and age were independent predictors of death or myocardial infarction within 1 year, while the presence of ST-segment depression on the admission ECG was not. The occurrence of ST vector magnitude episodes did not further subdivide the patients once the maximum ST vector magnitude level was accounted for, although this finding must be interpreted cautiously because of the limited number of patients.

In the light of the accumulated knowledge regarding the role of continuous ST-monitoring relative to the 12-lead ECG at rest for risk stratification in unstable coronary artery disease some conclusions might be drawn. ST-segment depression indicates an adverse prognosis regardless of whether it is detected in the standard ECG at rest or during ST-monitoring, and the more ST-depression the worse the prognosis. Thus, further ST-monitoring is not needed for prognostic purposes in the approximately one third of unstable coronary artery disease patients with obvious ST-segment depression in their admission 12-lead ECG. In unstable coronary artery disease patients without ST-segment depression on the admission ECG, ST-segment monitoring seems to add important prognostic information and identifies high and low risk patients. For continuous vectography monitoring ST vector magnitude episodes are still by far the best documented parameter for prognostic evaluation. The superiority of ST vector magnitude maximum over ST vector magnitude episodes suggested by Abrahamsson and co-workers needs to be confirmed in further studies and an optimal cut-off level defined and validated before ST vector magnitude maximum can be recommended to replace ST vector magnitude episodes as the preferred vectorcardiographic parameter for risk stratification. However, the ST vector magnitude maximum is attractive from a practical point of view, since it is easier to identify the maximum ST vector magnitude level from the trend curve than the more complicated parameters ‘area under the ST vector magnitude trend curve’ and ST vector magnitude episodes.

There are a number of other unsolved issues regarding the use of continuous ST-segment monitoring in unstable coronary artery disease that needs to be addressed in future studies. However many hours of monitoring are optimal? Is there any difference in prognostic significance in ST-segment deviation that occurs despite ongoing anti-ischaemic and anti-thrombotic treatment compared to before such treatment is initiated? Is there any difference in the effect of antithrombotic treatment or interventions in relation to ST-segment deviation? Despite these questions, continuous vectography monitoring offers the clinician a valuable non-invasive tool for the early assessment of unstable coronary artery disease patients. This is in addition to clinical data, the standard 12-lead ECG and new biochemical markers such as the troponins.

B. LINDAHL
Department of Cardiology,
University of Uppsala, Sweden

References