Motivation and aim: The adaptation time of the QT interval to sudden abrupt heart rate (HR) changes modeled as a first-order system response is an ECG marker to stratify patients for arrhythmic risk. In such a first-order model, this time constant, $\tau$, is the same as the delay in responding to a ramp-like HR change. Thus the time lag between the actual QT series and the expected memoryless HR-dependent QT series can be estimated from the exercise and recovery phases, being more feasible than from sudden step-like HR changes.

Materials: 39 stress test ECG recordings were selected from FINCAVAS study and divided into three groups, according to their likelihood for Coronary Artery Disease (CAD): low-risk, mild-risk and high-risk patients.

Methods: The memoryless expected HR-dependent QT interval time series, $\hat{QT}(n)$, was calculated by fitting four regression models to $[QT(n), RR(n)]$ data pairs in three stationary QT-to-RR dependent windows. The time lag, $\tau^*$, was estimated by a Mean Square Error fit between real $QT(n)$ and estimated $\hat{QT}(n - \tau^*)$ ramps, separately in exercise, $\tau_e$, and recovery, $\tau_r$, phases.

Results and conclusion: The hyperbolic model provided the best fitting, and therefore, the selected one. The average time lags for exercise and recovery phases ($\bar{\tau}_e = 26.65s$ and $\bar{\tau}_r = 69.97s$, respectively, in the low-risk group) are in line with those of a previous study estimated from step-like HR changes in daily activities ($\bar{\tau}_e = 34.79s$ and $\bar{\tau}_e = 48.40s$). Results show that the delay $\tau_e$ increases with CAD risk; whereas the difference, $\Delta_\tau$, between delays $\tau_e$ and $\tau_r$ is remarkably larger for low-risk patients, being much reduced when CAD risk increases. Interestingly, the delay $\tau_r$ manifests a significantly reverted behavior. In conclusion, the proposed markers $\tau_e$, $\tau_r$ and $\Delta_\tau$ show potential for CAD risk stratification.