

Title: Ultra Short-Term Heart Rate Variability As a Predictor of CABG Outcomes: A Retrospective Case-Controlled Study

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Abstract:

Introduction: Decreased heart rate variability (HRV), an indicator of cardiovascular health, is associated with poor outcomes following myocardial infarction (MI). Traditionally, HRV is analyzed using Holter monitor data over 5 minutes or more. Ultra short-term HRV, using a 12 lead ECG, has also been shown to correlate with 5-minute ECG measurements. While HRV has been shown to be associated with MI outcomes, its association with surgical outcomes has never been explored. We hypothesized that decreased ultra short-term HRV is associated with increased 30-day mortality after coronary artery bypass grafting (CABG).

Methods: After institutional review board approval, we conducted a retrospective case controlled study, examining all CABG patients who died within 30 days of surgery since 2008 (n = 31). Two controls for each case were then matched on STS risk score (n = 62). The patient's RR intervals were measured on the pre-operative 12 lead ECG, and heart rate variability percent (HRV%) was calculated using this data. Given the small sample size and an inability to control for a range of confounders, the significance level was set a priori at 0.1. The association between CABG mortality and HRV was analyzed using HRV as both a continuous and dichotomous variable. McNemar's test was used for dichotomous analyses, where low HRV was defined as below the median of 4 and high HRV as being 4 or above. Conditional logistic regression was used for continuous analyses.

Results: HRV and 30day CABG mortality were significantly associated in all analyses. As seen in Figure 1, the frequency distribution among survivors and non-survivors differed. In the continuous analysis, HRV and survival were associated (OR=1.08, p=0.07, 95% CI [0.98,1.2]). Similarly, in the dichotomous analysis there was a significant difference between the high and low HRV cohorts (OR=0.44, p=0.008, 95% CI [0.21, 0.84]).

Conclusions: Ultra short-term HRV appears to be associated with CABG mortality. This is the first study to explore the association between HRV and a surgical outcome. Because STS score includes a wide range of perioperative parameters, use of STS score as the matching criteria limited our ability to control for possible confounders. This likely weakened the observed association. Future studies with larger cohorts, controlling for more covariates, based on this initial pilot study is certainly indicated.