High Frequency QRS analysis to supplement ST-Analysis for Myocardial Ischemia: multi-center prospective cohort

Toral R Patel TRP[1]; Jamieson Bourque JMB[2]

[1]University Of Virginia Health System, Charlottesville, United States of America
[2]University of Virginia, Charlottesville, United States of America

Background: Exercise testing is a well-known non-invasive assessment method for myocardial ischemia in patients with suspected coronary artery disease (CAD). Stress electrocardiography (ECG) alone is underutilized in this population despite guideline recommendations in part due to poor diagnostic accuracy. High frequency QRS analysis (HF-QRS) is a novel tool to supplement standard ST-analysis during stress ECG and has been shown in single-center retrospective analyses to identify any and substantial ischemia with high diagnostic accuracy. We sought to compare the diagnostic accuracy of HF-QRS + standard ST-analysis compared to standard ST-analysis alone for the identification of moderate to severe myocardial ischemia by exercise SPECT MPI.

Methods: The study population included 388 consecutive patients who underwent exercise SPECT MPI. An ischemic HF-QRS pattern was defined as an absolute reduction of ≥1 µV and a relative reduction of ≥50% between maximal and minimal values of the mean root square of the 150-250 Hz band signal in ≥3 leads. The diagnostic accuracy of HF-QRS + ST-analysis was compared with ST-analysis alone for moderate to severe myocardial ischemia using chi-square analysis and semi-quantitative gated SPECT MPI as the gold standard. The incremental diagnostic value of HF-QRS was assessed by logistic regression analysis. The likelihood of any ischemia by number of leads positive for HF-QRS was also determined.

Results: The study cohort was 71% male and 84% Caucasian with a mean age of 58.3 ± 11.8 years. ST- and HF-QRS analyses were positive in 96 (24.7%) and 121 (31.2%) of patients, respectively. HF-QRS had a substantially higher sensitivity than ST-analysis for moderate-severe ischemia (66.7% vs. 40.0%, p <0.003). There was no statistically significant difference in specificities for HF-QRS vs ST-analysis for moderate-severe ischemia. (70.5% vs 75.7%, p = 0.08). There was a stepwise increase in ischemia as number of positive HF-QRS leads increased (p = 0.0004). HF-QRS demonstrated incremental diagnostic value to clinical risk factors without ST-analysis (p = 0.006) compared to Clinical + ST depressions (p < 0.001) versus clinical factors.

Conclusions: This multicenter, prospective study expands the literature showing the benefit of HF-QRS analysis. HF-QRS analysis substantially improves detection of moderate-severe ischemia over ST-analysis and clinical risk factors in patients undergoing exercise stress ECG. This noninvasive adjunct may improve CAD risk stratification and encourage use of stress ECG without imaging, reducing costs and radiation exposure.