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Young Investigators Awards

QT-RR HYSTERESIS IS CAUSED BY DIFFERENTIAL AUTONOMIC STATES DURING EXERCISE AND RECOVERY

Young Investigator Awards

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Session Title: Young Investigators Award Competition: Physiology, Pharmacology, and Pathology

Abstract Category: Physiology, Pharmacology, Pathology

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Background: QT-RR hysteresis is a phenomenon characterized by longer QT intervals at a given RR interval while heart rates are increasing during exercise and shorter QT intervals at the same RR interval while heart rates are decreasing during recovery. The mechanism of QT-RR hysteresis is debated, but has been attributed to differing directions of RR interval change during exercise and recovery.

Methods: Twenty control subjects (8 M, age 51 ± 6 y), 16 subjects with type 2 DM (12 M, age 56 ± 8 y), and 88 subjects with CAD (64 M, age 58 ± 12 y) underwent two 16-minute bicycle exercise sessions followed by 45 minutes of recovery. Session #1 was performed under physiologic conditions. In Session #2, parasympathetic blockade (PB) with atropine (0.04 mg/kg) was achieved at end-exercise. Continuous ECG was recorded and automated analysis was used to assess beat-to-beat QT and RR intervals and linear regression analysis was used to model the QT-RR relationship. QT-RR hysteresis was quantified as the area bounded by the QT-RR relationships for exercise and recovery in the range of the minimum RR interval at peak exercise to the minimum RR interval + 100 ms. The effect of PB was assessed by substituting the QTREC after PB.

Results: Of the 124 subjects studied, 110 had linear regression $R^2 > 0.5$ and were included in analysis. QT-RR hysteresis was positive in all groups at baseline and abolished by PB ($p < 0.0001$). RR intervals were increasing during recovery before and after PB.

Conclusions: QT-RR hysteresis is mediated by the parasympathetic autonomic nervous system, and is not caused by differing directions of RR interval change during exercise and recovery.