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AUTONOMIC CARDIAC CONTROL IN LONG QT SYNDROME

Clinical studies of arrhythmogenic triggers

Anna Lundström

Akademisk avhandling

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Fakultetsopponent: Professor, Jacob Tfelt-Hansen,

Department of Forensic Medicine, University of Copenhagen, Denmark.

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Author

Anna Lundström

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Autonomic cardiac control in Long QT syndrome - Clinical studies of arrhythmogenic triggers

Abstract

Background: Long QT syndrome (LQTS) is characterized by prolonged cardiac repolarization increasing the risk for life-threatening arrhythmias. These are triggered by adrenergic stimuli but can also occur during swimming and diving. This may indicate that both sympathetic and parasympathetic responses may be involved. The aim of this thesis was to study the cardiac autonomic response in LQTS patients during various activities, and in healthy adolescents during face immersion (FI) and ice-water body immersion. **Methods:** In **study I**, ECG were collected from 44 adult LQTS patients and 44 healthy controls during a bicycle exercise stress test. In **study II**, 24-hour ECG recordings (n = 575) during ordinary daily living was retrospectively collected in 116 children with LQTS. In **study III**, 15 children with LQTS type 1 and 15 matched healthy controls performed face immersion, swimming, diving, and whole-body submersion (WBS) with a waterproof ECG device. In **study IV**, 54 healthy adolescents performed FI and 20 performed ice-water immersion (IWI) of the body with a waterproof ECG device. Heart rate responses and heart rate variability (HRV) were assessed. HRV reflects the autonomic influence on the heart, where the high frequency (HF) component represents parasympathetic activity, and the low frequency (LF) both sympathetic and parasympathetic activity. **Results:** In **study I**, LQTS patients had a decreased heart rate reduction and lower HRV post-exercise compared to controls. In **study II**, LQTS patients had lower HRV at higher heart rates compared to controls. In **study III**, LQT1 patients had a smaller decrease in heart rate during FI and WBS and a lower HRV during FI and WBS than controls. **Study IV**, on healthy adolescents, showed that the diving reflex-mediated FI induced a more pronounced HR reduction and arrhythmias, compared with cold shock mediated IWI. **Conclusions:** The results from the ice-water study indicates that the ventricular arrhythmia risk is likely higher during whole-body submersion with apnea. The LQTS studies showed that these individuals have a deviated cardiac response to activities that affects the ANS, suggesting that both branches of the ANS might be involved in arrhythmogenesis in this patient group.

Keywords

Long QT syndrome, ECG, Holter, arrhythmias, heart rate response, heart rate variability, exercise, face immersion, swimming, ice-water immersion.

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