SHORT TERM HEART RATE VARIABILITY AS A GUIDE FOR DIRECT NONINVASIVE DETECTION OF VAGUS NERVE ACTIVITY

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The vagus nerve is the main parasympathetic modulator for many organs in the human body. Currently, vagal activity is non-invasively monitored by observation of its action on other body functions. Our interest is to investigate whether a direct noninvasive measurement of vagal activity by using highly sensitive superconducting quantum interference devices (SQUID) is possible. For that purpose, a SQUID system was placed over the neck region of two volunteers and a low-amplitude magnetocardiogram was measured. In order to achieve vagal stimulation, several breathing protocols were investigated. We evaluated short-term heart rate variability (HRV) indicators in order to identify vagal activation intervals, where we might expect vagal signals to be hidden below the noise floor of the acquired signals. Appropriate statistical signal processing methods might then lead to an identification of the vagal signal contributions. Here, we present the details and first intermediate results of the proposed measurement procedure. Characteristic changes in the RR-series and in pNNx parameters known from thorax measurements could be reproduced from the neck measurements. The parameter pNN60 is shown to be a potent marker for changes in heart rate variability even at short time intervals below 1 minute. During vagal stimulation, oscillations over the neck region were observed, that we interpret after control measurements over the forearm as muscle activity. A comparison of the frequency content of the signal intervals acquired over the neck with and without vagal stimulation revealed differences of unknown origin between 60 Hz and 70 Hz. Further studies are needed to prove the possibility of direct noninvasive measurement of vagal activity.