

IDENTIFICATION OF AUTONOMIC NERVE ACTIVITY FROM HEART RATE VARIABILITY

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ABSTRACT

Heart beat intervals, which are determined basically by regular excitations of the sinoatrial node as a cardiac pacemaker, shows significant variability due to influence of the activity of the central nervous system (CNS) through the sympathetic and parasympathetic branches of the autonomic nerve system (ANS). In recent years, it has been recognizing that the heart rate variability (HRV) shows a greater complexity than ever expected. This means that HRV could include much information useful to elucidate the CNS activity and to understand how the ANS controls the cardiocirculatory system.

Several recent studies reported that healthy adult's HRV shows a multifractal property. The multifractal property is associated with abrupt change in the heart beat interval, called "singularity," and the multifractal property of HRV means that various singularities are embedded in HRV at multiple time scale. Moreover, The ANS blockade decreases multifractality of HRV, implying that the multifractal property of HRV reflects the ANS activity and the multifractality of heart beat dynamics is a result of the complicated cardiocirculatory control by the ANS.

In this study, the multifractal property of the heart beat dynamics was utilized to investigate and characterize development of the ANS. Namely, we addressed the question "when dose multifractal property of HRV begin to appear?" We first investigated the multifractal property of HRV of fetuses, newborn infants and premature babies. Furthermore, we try to use multifractality of HRV as an index characterizing growth degree of newborn infants.

Keywords: multifractal, heart rate variability, autonomic nervous system

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