

The Development and Maintenance of Human Hypertension

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Perspective

Physiological and clinically based studies have demonstrated the involvement of autonomic function in the development and the maintenance of human hypertension. Recently, analysis of beat-to-beat heart rate variability has become established as one of the noninvasive methods to assess the influence of the sympathetic and parasympathetic systems on cardiac function. As a result of the interaction between sympathetic and parasympathetic activity, beat-to-beat heart rate shows periodontics over time. This periodontics can be identified through spectral analysis, whereby the observed heart rate is expressed mathematically by a function of time as the sum of a series of sine and cosine functions of varying amplitudes and frequencies (Hz).

A plot of the square of the amplitudes of those sine and cosine functions against their cycle frequencies is understood because the power spectral density for beat-to-beat pulse, or the heart rate variability (HRV) power spectrum. When the guts rate/time data are re-expressed during this mathematical form, previous work has shown that cycles with a frequency of 0.025 to 0.15 Hz are under the influence of both the sympathetic and parasympathetic nervous systems. Cycles with a frequency of 0.15 to 0.35 Hz are under the influence of the parasympathetic system only, and have been regarded as a marker of cardiac vagal function. The area under the power spectrum for cycles in the 0.025 to 0.15 Hz range is called low frequency power (LF), and in the 0.15 to 0.35 Hz range is called high frequency power (HF). LF represents the contribution to heart rate variability from the sympathetic and parasympathetic system, HF represents the contribution to the variability from the parasympathetic, and

the ratio LF/HF represents a measure of the balance of sympathetic and parasympathetic function. 10 several clinically based studies have found that hypertensive patients have a better HRV-LF and a lower HF, indicating reduced parasympathetic activity and sympathetic predominance. 67¹~ however, none of these results can be considered as conclusive.

No population based study in this area has been published, nor have data been available to investigate the temporal association of autonomic function and the development of hypertension. Therefore, this study is designed to assess the association of cardiac autonomic function, measured by time domain and spectral analysis of heart rate variability, and prevalent hypertension in a population based sample, and to test the hypothesis that cardiac autonomic function is related to the development of incident hypertension in a prospective mode. Individuals who participated in the baseline examination of the Atherosclerosis Risk in Communities (ARIC) study. ARIC may be a longitudinal study of cardiovascular and pulmonary diseases sponsored by the National Heart, Lung, and Blood Institute. It includes Community Surveillance and a Cohort component.

The ARIC cohort was selected as a probability sample of men and women between the ages of 45 and 64 years at four study centers in the United States, three of which enumerated and enrolled an ethnically diverse population (selected Minneapolis suburbs, MN; Washington County, MD; and Forsyth County, NC). The fourth quarter of the ARIC cohort was sampled from black residents of Jackson, MI. Details of sampling, study design, and cohort examination procedures are published. Eligible participants were interviewed at home, and then invited to a baseline clinical examination. The baseline examination of the ARIC cohort was conducted in 1987 to 1989.

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