



Biological rhythm in 1/f fluctuations of heart rate in asthmatic children

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Background: The 1/f fluctuations of heart rate (HR) have been used as a novel index of autonomic function from a chronobiological viewpoint. The autonomic function of asthma sufferers differs from that of normal children. Therefore, we investigated whether there are 1/f fluctuations in asthmatic children during an asthma attack and whether asthmatic children have a different rhythm of 1/f fluctuations in the 24 h after an asthma attack.

Methods: We recorded 24 h electrocardiographs of eight asthmatic children (three females, five males; median age 8.5 years; range 7-11 years) at the time of an asthma attack and during a non-attack period and examined the 1/f β fluctuations on HR and its rhythm over a 24 h period using the MemCalc system (GMS, Tokyo, Japan). The 1/f fluctuations on HR were calculated by the expression on a log₁₀(frequency) - log₁₀(power density) scale of the HR variability.

Results: The values of β (1/f β fluctuations of HR) for asthma attack and non-attack periods were 0.9 ± 0.07 and 0.96 ± 0.08 , respectively ($t = 1.59$; $P = 0.13$). During the asthma attack period, the rhythm was median 7.9 h (range 6.1-11.1 h), compared with 22.7 h (range 12.2-36.4 h) during the non-attack period ($t = 0$; $P < 0.001$).

Conclusion: During an asthma attack, the rhythm of 1/f fluctuations is ultradian (cycle length under 20 h), compared with various rhythms during a non-attack period. In future, we will clarify the relevance of the ultradian rhythm of 1/f fluctuations over a 24 h period and the biological life-support system at a point of time of an asthma attack.

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