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SPECTRAL ANALYSIS OF HEART RATE VARIABILITY IN ACROMEGALY

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ABSTRACT. The aim of this paper is to determine by means of spectral analysis the day and night values of spectral components for patients which have acromagaly. Spectral analysis of heart rate variability has proved itself very useful in recognizing the autonomous disfunction in various heart and some other diseases. In our case spectral components are obtained by using ″The Fast Fourier Transform″. Results showed increasing of night values LF and HF components in spectrum, in relation to day values. Our results show how physical methods can be successfuly aplied in medical analysis.

1.INTRODUCTION

The method most commonly used for spectral analysis is based on the discrete Fourier transform, usually implemented on the computer as the Fast Fourier Transform (FFT) [1]. With the availability of new, digital, high-frequency, 24-hour, multichannel ECG recorders, heart rate variability has the potential to provide additional valuable insigth into physiological and pathological conditions.

The clinical relevance of HRV was first recogized in 1965. when Hon and Lee [2] noted that fetal distress was preceded by alterations in interbeat intervals before any apreciable change occurred in heart rate itself. Sayers [3] focused attention on the existence of physiological rhythms imbedded in the beat - to - beat heart rate signal. Ewing et al [4] devised a number of simple bedside tests of short - term RR differences to detect autonomous neuropathy on diabetic patients. The association of higher risk of postinfarction mortalitaty with reduced HRV was first shown by Wolf et al [5] in 1978. In 1981, Akselrod et al [6] introduced power spectral analysis of heart rate fluctuations to quantitatively evaluate beat - to - beat cardiovascular control.

Frequency domain analyses contributed to the understanding of autonomous background of RR interval fluctations in the heart rate record. Low - frequency (LF) and High - frequency (HF) spectral components may vary in relation to changes in autonomous modulations of heart period [7].

Acromegaly is a chronic and slowly developing disease in which clinically progressive disfigurements or disabilities may be unnoticed, and the diagnosis can be delayed. It is a severe systemic disease because the growth hormone excess comes impairment of cardiac and respiratory functions that contribude to the increased mortality [8].

Acromegalic patents are exposed to a doubled moratlity rate, mostly of decanse cardiovascular diseases [9,10]. Excess of growth hormone is associated with several changes of cardiac structure and function [11].

The aim of this paper is to determine by means of spectral analysis, the day and night values of spectral commponents for patients which are sick of acromegaly.

2. ANALYSING SPECTRA OF HEART RATE VARIABILITY

Investigations were conducted on patients which are sick of acromegaly.

Heart activity of patiens was recorded by three-chanel holter (Del Mar, DM Scientific, Model 423). Electrocardiograms, recorded on magnetic tapes, were digitalized by means of commercial program Wavelab and analog – digital convertor, with sampling rate of 200 Hz. R-R intervals (time intervals between two successive heart beat) were determined by means of a Program set Origin. For analysys were used records of 256 succesive R-R intervals.

For statistical processing of data we used a program set SPSS.

By aplication of Fast Fourier Transform (FFT), to tahogram´s segments of 256 R-R intervals, and by using a Program set Origin, we obtained spectral components of low frequency (LF) of heart rate in the range (0,04-0,15) Hz and high frequency (HF) in the range (0,15-0,5) Hz.

Table 1: Day values of spectral components

Name of spectral component	**Numeric value**
LF	394.61±35.41
HF	121.72±8.77

Table 2: Night values of spectral components

Name of spectral component	**Numeric value**
LF	492.26±43.86
HF	413.44±20.08

Spectral analysis of heart rate variability showed itself as very useful in recongnition of autonomous disfunction in various cardiac and some other deseases.

Advantages of spectral analysis of heart rate variability over to other quantitative methods in study of autonomous cardial controle, especialy are emphasized by next facts: 1) analysis is noninvasive 2) there is the considerable simplicity of measurement procedure 3) data processing is very reliable.

The obtained results showed increasing of night values of LF and HF components in spectrum in relation to day values (Fig.1 and Fig. 2). We know that spectral LF and HF components may vary in accordance with autonomous modulation of heart rate: high frequency component (HF) is parasympatheticaly mediated, while the low frequency component is sympatheticaly / parasimpatheticaly mediated. In normal subjects during the

day there was a predominant low frequency component, while at night high frequency component predominated [7].

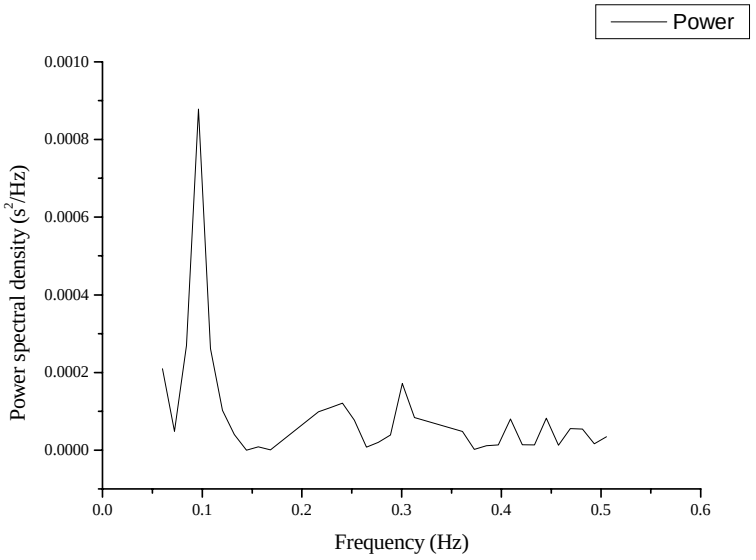

Fig. 1. The day HRV spectra

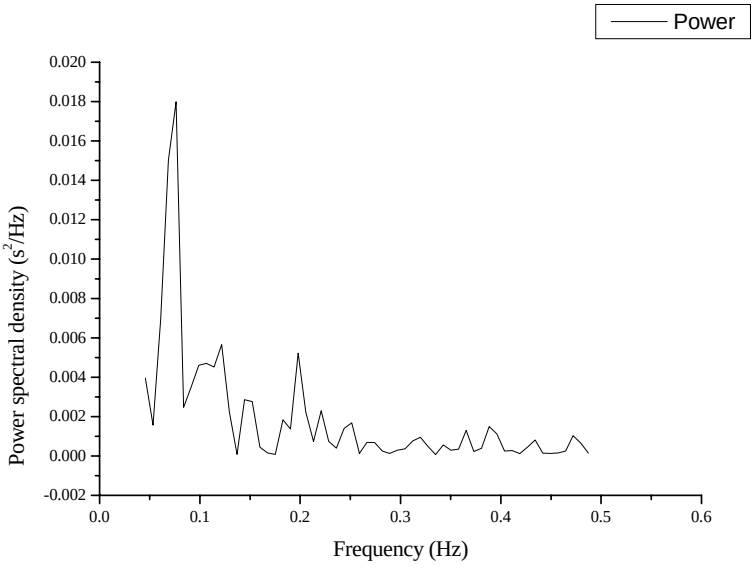

Fig. 2. The night HRV spectra

Our results may be useful for physicians in comprehending of same physiological processes and better doseing of medicaments.

3. CONCLUSION

Our goal was to determine by means of spectral analysis, which is par excelance a physical method, the day and night values of spectral commponents for patients which are sick of acromegaly.

It has been noticed that frequency domain analyses contributed to the understanding of autonomous background of RR interval fluctations in the heart rate record. Low - frequency (LF) and High - frequency (HF) spectral components may vary in relation to changes in autonomous modulations of heart period [7].

In our investigation we determined, by means of spectral analysis, the day and night values of spectral components for patients which are sick of acromegaly. Spectral components are obtained by using " Fast Fourier Transform". The obtained results showed increasing of night values of LF and HF components in spectrum, in relation to day values. This investigation may be useful for physicians in comprehending of some physiological processes and better doseing of medicaments. Also, our results show how physical methods can be successfuly aplied in medical analysis.

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