

Baroreflex Gain in Children with Obstructive Sleep Apnea

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ONLINE DATA SUPPLEMENT

INTRODUCTION

In the manuscript we defined blood pressure variability (BP) as the periodicity of the beat to beat systolic pressure measured by spectral analysis within the low frequency band (0.04 Hz to 0.15 Hz) and high frequency band (0.15 Hz to 0.5 Hz).

In this supplement we report the data on the difference in BP standard deviation (SD) between groups.

SUPPLEMENTAL METHODS

For each subject, BP SD from the 1-minute means data was calculated. An average for SD by stage of sleep was then derived. Group SD was calculated from the respective subjects in that group. The Wilcoxon nonparametric test was used to compare differences between groups. Spearman correlation was used to measure the degree of association between BP variability in the high frequency (HF) and low frequency (LF) ranges and systolic BP standard deviation.

RESULTS:

There was no significant difference in SD between the three groups (Table 1). A significant correlation between systolic BP variability in the low frequency range and systolic BP SD was measured (table 2).

DISCUSSION

Spectral analysis of finger Photoplethysmographic BP variability has been shown to be a robust way of understanding the autonomic control of the cardiovascular system (CVS) which is the main objective of the study. Spectral analysis was also proven to be a more valuable tool in discriminating abnormal from normal autonomic control of the CVS than

the simple time domain statistical measures of mean and standard deviation (SD). While both approaches could be considered measures of variability, spectral analysis measures the oscillation of BP over time but does not measure the dispersion of the data points from the mean. On the other hand, SD is limited to measuring the degree of dispersion from the mean but does not capture the oscillatory nature of the different cardiovascular parameters.

If both parameters of variability (spectral parameters and SD) are interchangeable, a high correlation between the power of the periodicity measured by spectral analysis and SD should be measured. We analyzed our own data to determine the correlation between spectral parameters and SD for systolic BP. We found no correlation between systolic BP in the high frequency range and systolic BP SD. There was a correlation of 0.18 ($p= 0.02$) between systolic BP in the low frequency range and systolic BP SD. These results show that SD does not describe the oscillatory behavior of BP which is the main objective of the study. Despite the lack / weak correlation between spectral parameters and SD, systolic BP in the low frequency domain and SD showed a positive and statistically significant association with relative wall thickness of the left ventricle (data shown in the manuscript).

To date, there is no consensus on the best index of BP variability that is applicable to all methods of BP measurements.

In the study of BP control, mean and standard deviation have been used in studies of 24-ambulatory blood pressure recording when the principles of spectral analysis could not be applied to relatively limited data points. Such limitation is no longer relevant when

thousands of BP data points are acquired by beat to beat finger Photoplethysmography over 7 hours of recording.

While we found in this current study a higher BP in children with sleep apnea compared to healthy controls, we did not measure a significant difference in the SD between groups. We can only speculate that once resetting of baroreceptors to higher BP takes place, the difference in BP variance measured by the statistical term (SD) decreases.

Table E1

Variable	Control	Mild	Severe
SBP STD Awake	7.6 ± 4.5	6.5 ± 4.5	7.3 ± 6.6
SBP STD NREM	9.3 ± 4	9.4 ± 3.7	8.7 ± 4.7
SBP STD REM	8 ± 5	7.3 ± 4.1	6.7 ± 5.4
*****	*****	*****	*****
DBP STD Awake	5.3 ± 3.3	5 ± 3.2	5.7 ± 4.8
DBP STD NREM	6.5 ± 2.5	7.2 ± 3.3	6.8 ± 3.5
DBP STD REM	5.8 ± 3.7	5.5 ± 3.4	4.8 ± 4.5 *

Mean standard deviation (SD) ± standard deviation of the mean for systolic blood pressure (SBP) and diastolic blood pressure (DBP) during wakefulness, non rapid eye movement sleep (NREM) and rapid eye movement sleep (REM).

Table E2

	SBP HF	SBP LF
SBP SD	0.08 ± 0.3	0.18 ± 0.01

Spearman correlation between systolic blood pressure (SBP) in the high (HF) and low (LF) and SBP standard deviation (SD)