

Effects of Spinal Manipulative Therapy on Autonomic Activity and the Cardiovascular System: A Case Study Using the Electrocardiogram and Arterial Tonometry

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OBJECTIVE: To determine if there is alteration in the autonomic nervous and cardiovascular systems after chiropractic manipulative therapy (CMT). A novel approach was used to quantitatively probe for changes in the activity of the autonomic nervous system, in blood pressure, and in pressure pulse transmission time. This approach uses the electrocardiogram and arterial tonometry equipment.

DESIGN: This case study involves 1 subject treated over a 6-week period (2 visits/week). Respiration, electrocardiogram, and left and right radial artery blood pressures were measured during the baseline (2 visits) and treatment (10 visits) phases. Measurements were obtained before ($n = 3$) and after ($n = 3$) a break period (baseline) or before and after CMT. High-velocity, low-amplitude CMT that produced joint cavitation was used.

SETTING: The study was performed at the Parker College Research Institute in a temperature-controlled laboratory. Main Outcome Measures: Fourier analysis was performed on the electrocardiogram-determined rest-redistribution intervals. The low frequency power between 0.04 to 0.15 Hz and the high frequency power between 0.15 to 0.40 Hz represent the activity of the sympathetic and parasympathetic nervous systems, respectively. The main outcome measure was the sympathovagal index, which is determined from the ratio of low frequency to high frequency. The arterial pressure and the time for pressure pulses to travel from the heart to the radial artery recording sites (pressure pulse transmission time) were studied. Differences (average of 3 measurements after treatment minus measurements before treatment) for each variable were calculated.

RESULTS: After the 1st CMT treatment, the difference between treatment and baseline decreased for both the low frequency/high frequency (-2.804 ± 1.273) and low frequency power (-0.135 ± 0.056). These findings indicated that the parasympathetic nervous system predominated the sympathetic nervous system. After the 3rd, 4th, 6th, and 9th treatment, the difference between treatment and baseline increased for low frequency/high frequency (0.908 ± 0.338 , 2.313 ± 0.300 , 2.776 ± 1.102 , and 0.988 ± 0.269 , respectively) and indicated that the sympathetic nervous system predominated the parasympathetic nervous system. In addition, the difference between treatment and baseline for the pressure pulse transmission time decreased bilaterally after the 4th treatment (left, -13.52 ± 3.70 ms; right, -9.75 ± 3.76 ms) and 6th treatment (left, -9.53 ± 3.60 ms; right, -9.24 ± 3.50 ms), which indicated that arterial compliance had decreased. Furthermore, after the 6th treatment, the difference between treatment and baseline for the rest-redistribution interval time decreased (-0.084 ± 0.014 s). The difference between treatment and baseline for the systolic, diastolic, and mean arterial pressure for the above-mentioned treatments was not considered significant.

CONCLUSION: This case study is the first to attempt to use electrocardiogram and arterial tonometry data to study the effects of CMT on the autonomic nervous and cardiovascular systems over an extended period of time. These devices allowed a more in-depth study of the cardiovascular and autonomic changes associated with CMT. Although changes in the autonomic nervous and cardiovascular systems can be detected, further development of a reliable and reproducible experimental protocol is required before validating the effects of CMT on these systems.

