Demonstration of Increased Vascular Characteristics Using Bilateral, Multi-Parameter Sensors, Following Controlled Vertebral Osteopathic Medical Treatment

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Introduction: Vertebral somatic dysfunction is described by sympathetic hyperactivity which affects related innervated visceral structures including blood vessels. This study investigates the influence of osteopathic manipulative treatment (OMT) on upper extremity vascular characteristics at selected vertebral segments.

Hypothesis: This study evaluates the hypothesis that OMT, using balanced ligamentous tension (BLT) at selected vertebral levels, affects upper extremity digital vascular flow, as well as electrocardiographic (ECG) characteristics.

Methods: Cardiovascular parameters were recorded in a continuous, non-invasive manner, from clinically asymptomatic subjects (13 female and 4 male, 19 – 58 years age), who were recruited to participate in an IRB approved study. Signals from both, the right and left hand for 28 total sessions were acquired by attaching the Photo-pulse- Plethysmogram (PPG) and Laser Doppler Flow (LDF) sensors on the index and middle finger tips, respectively. A 3-lead Electrocardiogram (ECG) signal was recorded simultaneously. For active sessions, subjects lay supine and BLT was performed by the osteopathic physician at sequential vertebral levels, OA-C2, T1-T4, T8-L2, and L5-Sacrum. A quiescent phase of approximately 8-12 minutes followed each region treated as the subject continued to lie passively. Data was acquired for these sessions lasting between 100 – 150 minutes. For baseline sessions, the subject was instructed to lie supine without disturbance for 45 – 75 minutes, and the same vascular parameters were acquired. Time domain analyses [peak-peak (PK-PK), and root-mean-square (RMS)], and frequency domain power spectral density (PSD), post-analyses was performed. The ECG data was analyzed to assess heart rate variability (HRV).

Results: A statistically significant difference in the RMS values was noted for the LDF and PPG signals (0.003 < p < 0.05), during the OMT phases, compared to corresponding phases from baseline sessions. Comparing active OMT and baseline sessions, active PSD demonstrated a higher magnitude of harmonics. Analysis of ECG data showed the heart rate during OMT to be statistically different from baseline sessions (0.001 < p < 0.05.)

Conclusions: This study successfully demonstrated increased peripheral flow (PPG, and LDF), and changed heart rate following BLT compared to baseline sessions, under continuous bilateral multi-parameter recording.

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Key words: Osteopathic manipulative therapy; autonomic response; peripheral flow assessment