

# Case Study

## Improvement in Motor Strength, Balance & Dysautonomia Following the Assessment & Correction of Vertebral Subluxation in a Male Stroke Survivor: A Case Study

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### Abstract

**Objective:** To document the improvement in motor strength and balance in a 40-year-old male stroke survivor following Torque Release Technique (TRT) and Activator Methods Chiropractic Technique (AMCT) for the assessment and correction of vertebral subluxation.

**Clinical Features:** A 40-year-old male with a 7-year history of right-sided lower limb motor weakness following an ischemic stroke. Postural alterations, reduced right-sided L2-3 motor strength and altered balance were found in conjunction with indicators of vertebral subluxation throughout the spine.

**Intervention and Outcome:** Chiropractic care using TRT and AMCT was provided for the assessment and correction of vertebral subluxation. The patient reported subjective improvement in strength and balance. Objective improvement in posture, motor strength, balance, and surface electromyography and thermography studies were recorded.

**Conclusion:** A course of chiropractic care using TRT and AMCT for the assessment and correction of vertebral subluxation was associated with improvement in motor function and balance in a 40-year-old male following an ischemic stroke. This case provides supporting evidence that stroke survivors may benefit from chiropractic care.

**Key Indexing Terms:** *stroke, chiropractic, vertebral subluxation, adjustment, motor strength*

### Introduction

Stroke is the rapid development of a focal neurologic deficit caused by either an occlusion (ischemic) or rupture (hemorrhagic) to the blood vessel supplying blood supply to a corresponding area of the brain.<sup>1</sup> Ischemic stroke is by far more common, accounting for over 80% of all strokes.<sup>1,2</sup> Stroke is increasing in prevalence, particularly in the young adult population.<sup>3,4</sup>

Globally an estimated 17 million people per annum suffer a stroke, with approximately 5 million of these people sustaining long-lasting physical disabilities following their stroke.<sup>1,3,4</sup> One of the most commonly occurring and long-lasting physical deficits following a stroke is hemiparesis, which can impair limb movement and function and an individual's ability to stand, balance or walk.<sup>5</sup>

The effects of stroke (physical, emotional, and social) impact not only the individual but those who support them.<sup>3</sup> The estimated cost of stroke annually in the United States exceeds

\$65 billion alone.<sup>1</sup>

Management of stroke patients follows a typical path of emergency medical intervention, including surgical intervention to control bleeding and clotting, followed by a regimen of interdisciplinary rehabilitation modalities including physical, occupational and speech therapies, thermal stimulation, electrical stimulation, and virtual reality.<sup>4,5</sup>

Spinal manipulative therapies have generally not been used in post-stroke clinical trials, however two recent trials have been used to investigate the impact chiropractic may have on this population demonstrating significant improvement in pulmonary function and motor strength following chiropractic adjustments.<sup>6,7</sup>

A core objective of chiropractic care is the assessment and correction of vertebral subluxation to optimize the health and wellbeing of individuals through the enhancement of nervous

system function.<sup>8,9</sup> A vertebral subluxation has recently been conceptually defined as a diminished state of being, comprising of a state of reduced coherence, altered biomechanical function, altered neurological function and altered adaptability.<sup>10</sup> Common to all models of vertebral subluxation are both biomechanical and neurological attributes.<sup>11-14</sup> Vertebral subluxation correction is achieved through chiropractic adjustments that are typically manually performed.<sup>15</sup>

The purpose of this paper is to document the improvement in motor strength and balance in a 40-year-old male ischemic stroke survivor following Torque Release Technique (TRT) and Activator Methods Chiropractic Technique (AMCT) for the assessment and correction of vertebral subluxation.

## Case Report

### History

A 40-year-old male, non-smoker presented with a 7-year history of right-sided lower limb weakness following an ischemic stroke. Since the stroke he had received 8-months of rehabilitation and Botox therapy to help reduce muscle tension, though lower back and right leg weakness remained. Since the stroke he has maintained an active as possible lifestyle, actively attended gym sessions, and reported both his physical and emotional health as 8 out of 10 on a 10-point numeric rating scale (where 1 is worst and 10 is best). No other conditions or symptoms were reported in his history.

### Examination

Posture examination, performed by observation, revealed a moderately higher right hip and shoulder, and left occiput, and forward head carriage with left head rotation. Global Cervical and Lumbar spine ranges of motion (ROM) was assessed using bubble inclinometry, with all ranges of motion being found to be generally within normal limits.

Motor strength assessments of the lower limb were assessed using the Oxford Manual Muscle Testing grading system, where 5/5 is considered normal with the person being able to complete the associated ROM against gravity with full resistance from the practitioner, down to 0/5 were no movement is able to be elicited against only gravity.

The examination revealed reduction of the right L2/3 (hip flexion) myotome rated as 3/5, and the right L3/4 (knee extension) myotome rated as 4/5. All other right-sided and all left-sided myotomes were rated as 5/5. Romberg test revealed significant uncontrolled sway and eventual complete loss of balance indicating a challenge in modulating proprioception. No other neurological assessments were performed.

Initial chiropractic examination for vertebral subluxation was performed using a battery of commonly used clinical indicators, including specific muscle palpation, intersegmental motion palpation, joint end-feel, leg length inequality, Derifield and Cervical Syndrome.<sup>16</sup> Vertebral subluxation was indicated at C1, C3 and L2 on the right, and C2, C5, L3, sacrum and ilium on the left.

Surface EMG (sEMG) and thermography studies were performed using the Insight Millennium. Surface EMG is used to measure paraspinal muscle dysfunction, a manifestation of vertebral subluxation, and a neuromuscular response to chiropractic care.<sup>17,18</sup>

Surface EMG revealed areas of varied hyperactivity recorded diffusely throughout the thoracic and cervical regions of the spine (Figure 1). Thermography is used as an indirect measure of autonomic nervous system function (dysautonomia) to assess the impact of vertebral subluxation on the nervous system.<sup>19</sup>

Thermography revealed varying degrees of autonomic abnormality from C1, C2 and T3 (Figure 1). In both assessments red and black bars represent hyperactivity of 3 standard deviations from the normative data, blue 2 standard deviations, and green 1 standard deviation.

### Intervention and Outcomes

Chiropractic care was administered over 10 visits during a period of 5-weeks. Chiropractic care was administered using TRT protocol as the primary model of care. The TRT model of chiropractic care, a tonal model, focuses on detecting areas of vertebral subluxation at locations of dural attachment, being the occiput, upper and lower cervical spine (C1, C2, C5), sacrum, coccyx and the pelvis, assessed through primarily functional leg checking and confirmatory spinal pressure testing procedures, through a prioritized, non-linear assessment protocol. The application of the chiropractic adjustment is via the Integrator™ instrument.<sup>20</sup> The occiput (10 times), C1 (6 times), C2 (6 times) and the coccyx (5 times) were the most commonly adjusted levels.

The addition of AMCT assessments of the lumbar spine was also used after the initial assessment and adjustments made following TRT protocol on each visit to assess for segmental vertebral subluxations. The AMCT protocol uses a functional leg-length analysis combined with provocative maneuvers (isolation tests) to determine involved spinal levels.<sup>21</sup> An Activator II™ instrument was used to deliver the adjustments as indicated. The most commonly addressed levels were L5 (5 times) and L4 (3 times). Practitioner choice to use TRT and AMCT was due to patient request that the adjustments are delivered while the patient is in the neutral position, is a lower force technique, and is non-manipulative. No other intervention was performed by the chiropractor during the course of care.

At the time of the 3<sup>rd</sup> visit the patient reported being aware of greater strength in the right leg. This observation by the patient remained for the remainder of the program of care. The patient reported throughout the program of care that he was aware that his balance was improving and that his posture felt more balanced. At the time of the 9<sup>th</sup> visit the patient reported that his leg strength had improved to the point that he had increased the weight used in leg exercises (leg press and calf raise) by 20kg.

Examinations of motor strength and cerebellar function were performed throughout the patient's care. By the 4<sup>th</sup> visit hip flexion had increased to 4/5 and knee extension to 5/5. By the

7<sup>th</sup> visit, Romberg test resulted in minimal sway without falling.

A progressive examination was performed on the 10<sup>th</sup> visit. Posture examination revealed only mild distortions compared to the previous moderate findings.

Motor strength assessments of the lower limb revealed all myotomes now rated as 5/5. The Romberg test remained a minimal sway without falling.

Surface EMG revealed significant reduction in areas of hyperactivity throughout the spine, and a normalization of the graph distribution (Figure 2). Thermography revealed far fewer areas of autonomic abnormality, now only at C3 and L5 (Figure 2). These results represent a generally more balanced paraspinal neuromuscular function, and an overall reduction in dysautonomia following chiropractic care.<sup>17-19</sup>

## Discussion

This case documents a course of chiropractic care associated with the improvement in residual lower limb motor weakness and balance in a 40-year-old male who had experienced an ischemic stroke 7-years prior. Chiropractic care focused on the assessment and correction of vertebral subluxation.

Chiropractic care in relation to stroke has typically been a controversial topic that has produced much popular media hype around a falsely reported link between the two, though no evidence supports a causal link.<sup>22-25</sup> Though limited, there is a growing body of evidence that suggests chiropractic management of stroke survivors can be positive for both their physical and emotional wellbeing.<sup>6,7,26-29</sup>

Recently a randomized controlled crossover study found a significant increase in lower limb motor strength (plantar flexion) and V-wave amplitude following a single session of chiropractic care focused on the correction of vertebral subluxation.<sup>7</sup> The study, conducted by Holt et al, is the first of its kind and had an intervention group of 12 participants. These findings are consistent with other population trials that have shown increased motor strength following chiropractic care and spinal manipulation.<sup>30-32</sup>

Four case reports have been published that echo the findings of Holt et al. and reflect the experience of stroke survivors receiving chiropractic care in clinical practice.<sup>26-29</sup> In all cases motor function improved, although the chiropractic intervention used was different in each case.

The positive results seen in the patient's motor strength and balance are consistent with previously presented evidence.<sup>7,26-29</sup> While there is limited current research investigating the effects of chiropractic care on stroke survivors, this is a developing area of investigation. Further higher level research is needed to investigate the role chiropractic care may play in helping similarly presenting patients so as to inform clinical practice.

## Limitations

This study reports only a single case. Due to the inherent limitations of case reports, being an isolated case not controlled for external factors and natural progression, the findings cannot be generalized or correction of vertebral subluxation implied.

## Conclusion

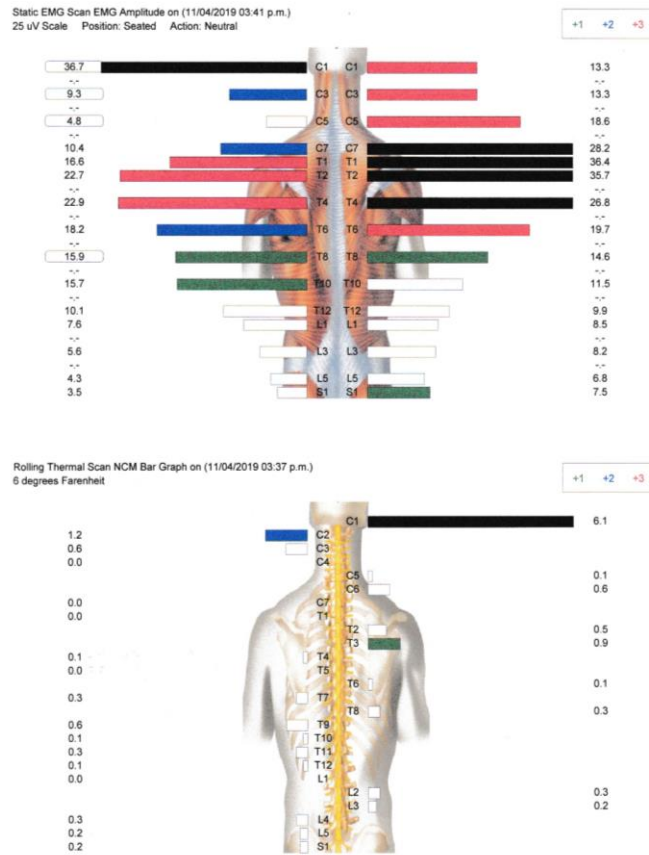
A course of chiropractic care, using TRT and AMCT for the assessment and correction of vertebral subluxation, was associated with improvement in motor function and balance in a 40-year-old male following an ischemic stroke. This case provides supporting evidence that stroke survivors may benefit from chiropractic care.

## References

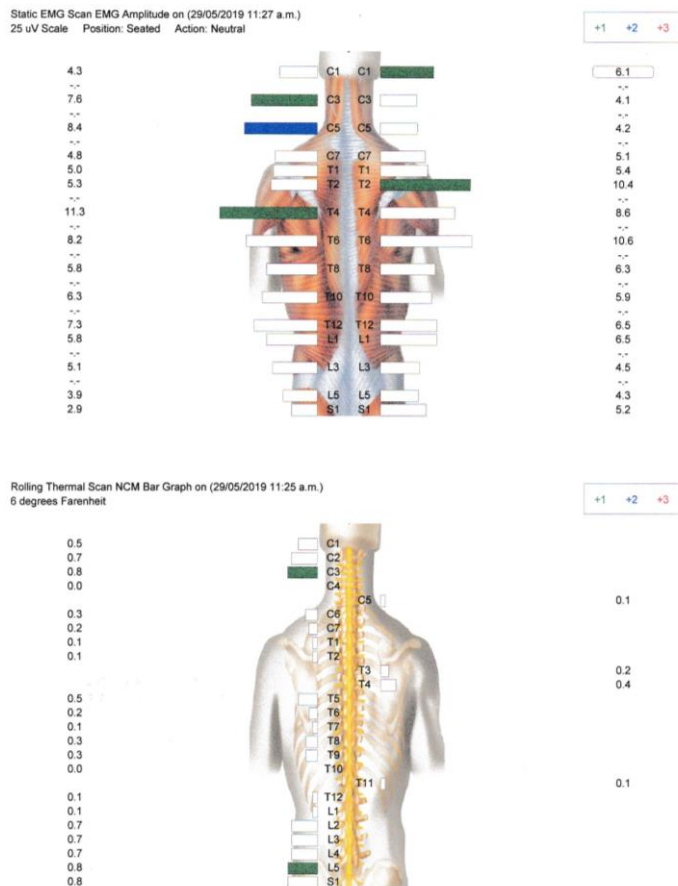
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# Appendix



**Figure 1.** sEMG and thermography assessment results prior to a course of chiropractic care



**Figure 2.** sEMG assessment results post a course of chiropractic care