Effects of an Upper Cervical Adjustment on Paraspinal Temperature Differentials

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ABSTRACT

Background: Thermography is a non-invasive, painless, and safe examination suitable for the investigations of the thermal function of the sympathetic nervous system. Traditional and current chiropractic methods use "pattern analysis" of paraspinal thermography as a guide for the application of a chiropractic intervention. Changes seen in thermographs when properly recorded likely reflect changes in neurophysiology rather than equipment error. The clinical value of paraspinal thermography has been suggested in indicating thermal presentations of autonomic abnormality and the response to an upper cervical chiropractic intervention.

Objective: To assess effects of upper cervical toggle recoil adjustment on paraspinal thermal asymmetries of the lumbar spine and full spine thermographs.

Study Design: This study was a double-blind research study. Each participant served as their own control allowing for accurate results to be measured.

Methods: Participants were analyzed using the Tytron C-5000, thermography scanner, to determine their thermographic pattern. The participants were measured before and after an upper cervical adjustment to determine changes in the paraspinal temperatures of the entire spine with specific attention on the lumbar spine. Participants were given rest time before and after the scans and the intervention to allow participants become acclimated to the ambient temperature and to ensure accurate scans pre and post-intervention.

Results: Changes were seen in the paraspinal temperatures in each participant's scans. Eight of the participants showed significant changes in the lumbar spine while the others showed varying degrees of change in the lumbar, thoracic, and cervical spines.

Conclusion: The observed changes provide support that an upper cervical adjustment has effects on paraspinal temperature differentials.

Key Indexing Terms: *Chiropractic; Thermography; Thermograph; Pattern Analysis; Subluxation; Toggle Re-coil; Upper Cervical Chiropractic; Tytron C-5000*

INTRODUCTION

Skin temperature is largely regulated by the autonomic nervous system. [1] This system is likely influenced by central mechanisms such as cortical[2], hypothalamic[3], brain stem[4,5], and spinal cord[4] neural activity.

Thermography has an application in almost every branch of medicine. [6-34] It is non-invasive, painless, and safe for both a patient and a diagnostician. [6, 35] Certain thermographic findings are associated with a low threshold for pain. [8] Thermographic evaluations may make it possible to detect some subclinical problems before they are clinically symptomatic. [36] Infrared thermal imaging may be useful in sports medicine by allowing for early detection and intervention in cases of abnormal changes in tissue. [36-37]
Infrared thermal imaging is a sensitive test suitable for the investigation of the thermal function of the sympathetic nervous system; it objectively identifies areas of sympathetic nerve damage or partial sympathetic nerve dysfunction. [7, 38]

Thermographic studies have been used in the investigation of melyopathy and to help confirm spinal root compression syndromes associated with herniated disk, osteophytosis, canal stenosis, lateral recess stenosis, and subluxation. [39-45] Since 1924 chiropractors have used paraspinal thermography to investigate chiropractic subluxations.[46] Chiropractic subluxations are theorized to be manually correctable spinal lesions that can potentially cause or aggravate neuropathophysioloy. A variety of chiropractic techniques utilize paraspinal thermography, using “pattern analysis” of temperature differentials as a guide for the application of chiropractic intervention. [47-47] Clinical case studies reporting thermograph differential analysis as an essential part of chiropractic care have been published in peer-reviewed literature. [49-57] Normative data for paraspinal thermography has been published. [58] Literature demonstrates good to excellent reliability of paraspinal thermal scanning. [46, 59] It is appropriate to investigate the clinical significance of thermograph pattern analysis in the manual correction of chiropractic subluxations.

The clinical value of paraspinal thermal scanning is thought to be in indicating a thermal presentation of autonomic abnormality, and recording the response of the patient to chiropractic intervention. [60] Changes seen in thermal scans when properly done are most likely due to changes in neurophysiology, rather than equipment or operator error, and could help to explain the clinical effectiveness of chiropractic care. [46]

Investigators have noted surface temperature changes following spinal manipulation in the area of the applied force. [61-62] However, there are few published studies examining the effect of manual upper cervical chiropractic intervention on persistent characteristic thermal asymmetries on full spine thermographs.

To obtain accurate thermographic recordings acclimatization in a temperature- and humidity-controlled environment for a minimum 8-16 minute period, followed by an 8-minute maximum recording period has been recommended. [47, 63-64] In order to provide consistency for repeatable measurements anatomical landmarks are used to delineate the region of interest for data capture.

METHODS

Prior to the research being conducted participants were recruited and informed of the inclusion criteria for the research. This study was approved by Logan's Institutional Review Board and app participants signed consent forms. Each participant's previously taken x-rays were obtained and their Atlas listing, or misalignment, was determined using the X-ray marking protocol found in Essentials of Toggle re-coil by Dr. Strazewski D.C. After the listing was obtained the subjects presented to the study and changed into a gown so that the participant's paraspinal area could be exposed to obtain an appropriate thermographic analysis. Nest the participants laid supine for 10 minutes, to allow for the skin temperature to normalize to the temperature of the room and more importantly the temperature of the Tytron C-5000 scanner. This ensures that accurate temperature readings are obtained. After the first 10 minute resting period the participant incurred a full-spine paraspinal temperature reading with the Tytron C-5000 scanner. Next the participant rests supine for another 10 minutes to determine whether resting, a period of supine relaxation, affects the paraspinal temperatures after it has become acclimated to the environment. In doing this, each participant will function as their own control for the research.

After the second paraspinal temperature reading the participant were adjusted by one author (JT) using the toggle re-coil technique according to their specific listing obtained through examination of their x-rays. The adjustments were supervised by a licensed doctor of Chiropractic. After the adjustment the participant rested for 10 minutes to allow for the body to react to the adjustment. After this 10 minute rest the participant was scanned again to see the effect of an Atlas adjustment on the paraspinal temperatures and neurophysiology of the participant. After this scan the participant rested for a final 10 minutes to ensure an accurate reading post-adjustment and to monitor the time it takes for the lower spine to show changes due to the adjustment. A flowchart depicting the method is attached (Appendix 1).

RESULTS

Changes in paraspinal thermal differentials were noted in the lumbar spine after rest and after adjustment. In five of the subjects there were reductions of substantial lumber thermal asymmetries that remained after pre-rest. This reduction of thermal asymmetries is one of the objectives of upper cervical chiropractic care.

Eight of the participants had reductions of lumbar differentials after pre-rest ranging from 0.30 to 0.64°C. Two subjects did not have any changes in lumbar differentials greater than or equal to 0.3°C. One subject had differentials increase after pre-rest of 0.58°C, in addition to the cervical and thoracic spines, where differentials decreased. About 6cm superior to this increased asymmetry was a 0.45°C decrease, 3cm superior to it was a decrease of 0.67°C, and 3cm inferior to it was a 0.51°C decrease. One subject did not have any changes in lumbar thermal asymmetries greater than or equal to 0.3°C after pre-rest or 20min post rest.

Six participants showed reduction in lumbar paraspinal thermal asymmetry following C1 correction ranging from 0.41 to 1.07°C. Five subjects had an increase in differentials following the intervention ranging from 0.30 to 0.58°C. Two participants showed both increase and decrease in differentials following the adjustment. One subjects demonstrated a 0.54°C reduction in a lumbar spine differential that was greater than 1.1°C and was unchanged during pre-rest. This occurred about 6.5cm inferior to areas with 0.4°C increases. These areas of increasing differential appeared adjacent to asymmetries that persisted after the pre-rest. This resulted in a dampening of waves noted during the visual inspection of the lumbar thermographic exam. One subject with both increasing and decreasing lumbar asymmetries revealed a 0.54°C decrease, 20 minutes after the intervention, to a differential not affected by pre-resting. This occurred after an initial increase in asymmetry of 0.3°C in this area. This initial increase was not a result of the reduction of a differential; visual inspection of the paraspinal thermograph reveals an inferior shift of 0.47 cm after the correction. This differential had the same amplitude as it did during the pre rest after 10 minutes of rest, and a decrease was not noted until 20 min after the correction.

DISCUSSION

Given that this was a pilot study, further investigations are warranted due to limited participants and quality control concerns for the equipment and testing of the study. Being that this was a study at Logan College of Chiropractic and due to a minimal research budget for the investigation, the participants used previous full spine x-rays which were taken for a course, and were not specific to the study. Logan is equipped to take 2 of the 4 x-ray images described in the upper cervical toggle re-coil protocol in order to determine a misalignment. The AP open mouth and lateral cervical projections were taken as full spine views with the central ray far below the area of interest causing distortions and possible errors with respect to x-ray analysis which is critical in determining a proper line of correction. Another limitation of the x-ray equipment is the lack of a tilting bucky. The tilting bucky is another way to remove the variable of image distortion due to the fact that it can be positioned according to the patient’s posture thereby reducing the shadow cast on the bucky.

Post adjustment rest periods should be lengthened. Due to time restraints, this study could only accommodate two 10 minute rest periods for both the pre and post. The first pre-rest period was sufficient due to the fact that its purpose is for the person to acclimate to the ambient room temperature thereby resulting in a more accurate thermographic reading. Ideally, the participants would have had a second pre and post rest period of no less than 1 hour with scans being given every half hour. This number is reached by anecdotal evidence from varying field doctors and current research stating that this is the required time of post rest to notice a significant change in full spine thermographic differentials.

Changes in the thoracic and cervical spines were observed but not measured and recorded. These changes likely reflect alterations in the neurophysiology. It is unknown at this time as to what extent these changes were or how long they lasted. Follow-up studies are recommended with alterations in the protocol as discussed. The results are promising that an atlas (Cervical vertebrae 1) correction utilizing the toggle re-coil protocol can cause changes in (and possibly stabilize) paraspinal thermographic differentials that are clinically meaningful.

CONCLUSION

Though this study had a small sample size, substantial paraspinal temperature changes were observed. Overall, changes in the paraspinal temperatures in the lumbar spine were seen in many of the participants. This shows that an atlas correction (cervical vertebrae one) has an effect on the paraspinal temperature of the lumbar spine. Changes following the intervention were measured in the cervical and thoracic spines as well, but were not recorded.

Since changes in paraspinal temperatures were seen in the lumbar spine, this shows that an upper cervical correction has some effect on spinal neuropathophysiology. More research should be done to determine the degree and longevity of the paraspinal temperatures.

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APPENDIX 1: INVESTIGATION FLOWCHART

Participant Recruitment

Inclusion/exclusion form completed and informed consent signed

Participant presents to study with full spine AP and Lateral x-rays

Participant changes into gown removing all clothing over the paraspinal area

First scan occurs

Participant rests prone for 10 minutes

Second scan occurs

Participant receives adjustment

Participant rests prone for 10 minutes

Third scan occurs

Participant rests prone for 10 minutes

Final scan performed