CASE REPORT

Cervicothoracic Subluxation and Hot Flashes in a Perimenopausal Subject: A Time-Series Case Report

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Abstract — A time-series study of a 55 year old woman, with a four year history of hot flashes related to natural perimenopause, is reported. A distinct downward trend in the frequency of hot flashes, based on entries from the patient's diary and clinical records, is noted following intervention with cervical and upper thoracic adjusting. Possible mechanisms and implications for future investigation are discussed.

Key words: Chiropractic, Vertebral Subluxation, Hot Flash, Menopause, Perimenopause, Time-Series Design.

Introduction

Due to the cavalier treatment afforded to menopause and perimenopause by the health care community historically, it is very difficult to arrive at a universally consistent symptomatic picture of this stage of life. However, the vasomotor manifestation know as "hot flashes" is a commonly recognized disabling symptom associated with menopause. These are episodes of intense vasodilation in the skin, particularly at the head, neck, and chest. These hot flashes are usually accompanied by profuse sweating, and often involve transient feelings of suffocating.[1]

Recent studies suggest that approximately 75% of perimenopausal and postmenopausal women experience hot flashes; and that hot flashes may predispose women to anxiety, insomnia and other symptoms. [2]

Disturbed thermal regulation is referred to as "abnormal calorific function" in the classical chiropractic literature, and has long been associated with vertebral subluxation.[3]

This association led to the development in the 1920's of instrumentation designed to locate areas of thermal asymmetry in the paravertebral tissues. More recently, authors have related this thermal asymmetry to disturbed cutaneous vasomotor tone.[4] Normalization of vasomotor tone following a chiropractic adjustment is considered to be consistent with the reduction of vertebral subluxation.[5]

This recognized link between vertebral subluxation and disturbances of cutaneous vasomotor tone suggests that subluxation may be implicated as a provocative factor in hot flashes. The chiropractic literature in regard to hot flashes is scant, however. Interestingly, Gonstead proposed that thoracolumbar vertebral subluxations would be the most likely to provoke hot flashes.[6] Recently, the present authors presented the case of a 31 year old female patient experiencing hot flashes following injections of leuprolide acetate which artificially induces menopause.[7] In this case, adjustments primarily in the upper cervical and cervicothoracic segments resulted in resolution of both hot flashes and concomitant neck pain. In the present study, the relationship between cerviothoracic subluxation and hot flashes has been reported in a patient in perimenopause.

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Presentation

The patient, a 55 year old woman, responding to an appeal in an office newsletter, announcing a study regarding the effects of chiropractic care on hot flashes, presented on 8/17/93. Five weeks prior to that date, a visit by this same patient was prompted by low back pain and left foot pain following a move to a new home. This episode was resolved with an adjustment during that visit. No mention of hot flashes was made at that time. Upon presentation for the research study, five weeks later, the nature of the project was explained, and informed consent was obtained. The patient had received no adjustments, nor made any subsequent visits for the five week period prior to presenting for the study.

The patient revealed that she had been experiencing hot flashes for the past four years. For the previous eighteen months she had used an estrogen patch which reduced her frequency of hot flashes from approximately once every twenty minutes to about four times per day.

Four months prior to her presenting date for the research study, the patient underwent surgery for repair of a detached retina. She continued to experience double vision at the time of presentation for the study. The patient also complained of neck "soreness" which had commenced three to four weeks prior to presentation for the study. Visual analog scales (VAS) for neck pain were administered. The patient rated her pain at 4.1 cm (0 cm represented no pain, and 10cm represented "extreme pain"). This

Table 1 — Summary of Baseline and Intervention Data*

	Baseline	Intervention (Adjustment)									
Weeks of Care	1–3	4	4-5	5	6	7	8-9	10-11	12-13	14-15	16-19	20-22
Date of Adjustment	–	9/8	9/11	9/15	9/20	9/27	10/8	10/22	11/3	11/19	12/3	1/3
Days between Adjustments	22	3	4	5	7	11	14	12	16	14	31	15
Hot Flashes	90	12	9	11	14	19	12	13	8	5	28	8
Mean No. of Hot Flashes	4.1	4.0	2.3	2.2	2.0	1.7	0.9	1.1	0.5	0.4	0.9	0.4
Std. Dev.(±) of Mean	(1.2)	(0.8)	(0.4)	(0.8)	(0.8)	(0.6)	(0.7)	(1.0)	(0.6)	(0.6)	(1.03)	(0.6)
Hot Flash Free Days	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.0	9.0	10.0	12.0	9.0
% Days Hot Flash Free	0.0	0.0	0.0	0.0	0.0	0.0	45.0	25.0	56.0	71.0	39.0	60.0

* The information reflects a combination of clinical and patient collected data. Clinical data included the weeks of care, dates of adjustments, and days between adjustments. The patient recorded the number of hot flashes on a daily basis. At the end of the study, the number of hot flashes were categorized as a function of the interval between adjustments. The mean and standard deviation were then determined for the number of hot flashes/interval between adjustments. This data is also represented graphically in Figure 1.

soreness was accompanied by a feeling of weakness and tingling in the left arm. Physical examination revealed a mild reduction in deep tendon reflex activity at the right triceps brachii muscle when compared to the left, relative hypoesthesisa at the left T1 dermatome, and hypomobility in right lateral flexion at the T1-T2 motion segment.

Other findings included hypomobility at the C2-C3, T5-T6, L3-L4, and right sacroiliac segments, along with reduced active range of overall cervical motion in all planes except flexion. The neck flexor muscles were also found to be weak bilaterally on manual testing against mild resistance.

Study Design and Plan of Care

During a baseline period of three weeks, the patient kept a daily record of the number of hot flashes. This practice was continued throughout the period of the study which began on 8/17/93 and ended 1/15/94. The use of a baseline period followed by an intervention period allowed the patient to act as her own internal control, thus constituting a single subject time-series design. [8]

Following the baseline period, intervention consisted of adjustments for the correction of vertebral subluxation, ranging from the occiput to T2. Visit-to-visit selection of areas to adjust was determined by motion palpation[9] and kinesiologic challenges.[10] Subluxated boney segments were adjusted by manual high velocity low amplitude procedures, according to Diversified protocols.[11]

Vertebral subluxation correction was supported by reduction of cranial somatic dysfunctions, identified through kinesiologic challenges, by manual and respiratory assist procedures.[10] While each visit was different, with regard to adjustments, most visits involved at least one adjustment between occiput and C2, and at least one adjustment of C7 or T1.

Methods

During the period of the study the patient was asked to avoid any changes in her estrogen patch schedule, barring medical advice. She was able to comply with this request, as no change in schedule was advocated by her medical physician. To avoid inconsistencies in technique, one of the present authors administered all vertebral adjustments and support procedures. Physical examinations, excepting motion palpation and kinesiologic challenges and data collection, were administered by the other author.

Analysis of Data

The patient's daily record of hot flashes was categorized into data groups corresponding to the duration of baseline (22 days), and intervals between adjustments over the twenty two weeks of

the study. The number of hot flashes per adjustment interval were designated by the number of the adjustment. For example, interval 1 data corresponded to the number of hot flashes occurring between the first adjustment and the second. This procedure was adopted for all intervals corresponding to the first through the eleventh and final adjustment of the study. Data analysis involved comparison of all data groups to the baseline, as well as from group to group. This was done to ascertain if changes were occurring relative to the intervals associated with adjustments. All data was analyzed by a two tailed T-Test ($P<0.05$), assuming unequal variances.[12]

Results

Hot Flashes

The patient's diary reports of daily hot flashes, and frequency of adjustments are presented in Table 1. As can be seen from the data, the patient averaged 4.1 ± 1.2 hot flashes per day during the 22 day baseline period of 8/17/93 - 9/5/93. This was consistent with the average reported prior to beginning the study. The first adjustment was given on 9/8/93, and the last on 1/3/94. The study was ended on 1/15/94, when after 15 days following the eleventh adjustment, the patient did not reveal indicators of vertebral subluxation.

Throughout the duration of study, the intervals between the eleven adjustments ranged from 3 to 31 days (Table 1), with the median being eleven days. A decline in reported hot flashes from baseline occurred consistently throughout the duration of the study (Figure 1). However, a significant decrease from baseline was not apparent until the period following the second adjustment (9/11-9/15, Table 1.) During this interval the frequency of hot flashes dropped significantly from base line by 44%. Subsequent changes over the next nine adjustment intervals revealed significant decreases from baseline in all intervals (Table 2, column A). The greatest percent decrease (90%) from baseline was recorded following the ninth and eleventh adjustments.

The decline in numbers of hot flashes per adjustment interval appeared, in general, to level off following the sixth adjustment. This can be seen from Table 2 where the number of hot flashes in this interval are not significantly different from those in the adjustment intervals following (7 - 11), but are different from preceding intervals (BL - 5). This observation is reinforced

Figure 1: The mean values of number of hot flashes/interval (days) between adjustments, is plotted against the number of the adjustment to show the declining trend of hot flashes over the duration of the study. Since the number of days between adjustments varied from three to 31, the graph depicts an exaggerated rate of decline as the adjustments have been plotted in equal intervals to conserve linear space on the x axis. The actual frequency of decline between adjustment intervals, and the baseline interval, were compared and reported in Tables 1 and 2.

Table 2 — Statistical Comparison of Frequency of Hot Flashes During Baseline and Each Interval Between Adjustments*

	Adjustment Number (Corresponds to Adjustment Intervals)										
Baseline (BL)	1	2	3	4	5	6	7	8	9	10	11
	Baseline Interval, or Adjustment Intervals, Showing Statistical Difference From Above										
2	5	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
3	6	6	6	6	1	1	1	1	1	1	1
4	7	7	7	8	6	2	2	2	2	2	2
5	8	8	8	9	8	3	3	3	3	3	3
6	9	9	9	10	9	4	–	4	4	4	4
7	10	10	10	11	10	5	–	5	5	5	5
8 (9–11)	11	11	11	–	11	–	–	–	10	9	–
Column	A	B	C	D	E	F	G	H	I	J	K	L

* Statistical analysis involved a two-tailed t-test assuming unequal variance. Each group of data was first compared to the baseline interval, then compared to each other group. The groups of hot flash data, represented by the number of the adjustment interval in which they were categorized (or the baseline interval), is tabulated vertically beneath the data interval between adjustments to which they were compared. All differences reported in the table are expressed at $P<0.05$. Dashes (–) indicate no statistical difference.

by data which shows that hot flashes during the first five adjustment intervals were, with few exceptions, significantly greater than those occurring during the sixth through eleventh adjustments (Table 1).

Hot flashes were also observed to be different between the ninth and tenth adjustments. During these intervals, though still significantly below the baseline as well as intervals through the fifth adjustment, the average number of hot flashes doubled from the ninth to the tenth adjustments, then declined again following the eleventh adjustment interval.

Although the data is presented as mean values, it is important to point out that following the sixth adjustment through the eleventh adjustments, there were a total of 48 days out of 102 (47%) during which there were no recorded hot flashes (Table 1). Out of the remaining 54 days, the number of episodes was never greater than 2, with one exceptional day during which 5 were recorded. This is compared to baseline episodes ranging from 2 to 7 per day, with no days free of hot flashes. Although there were no hot flash free days through the fifth adjustment interval, the highest number of episodes was 3 with the exception of one day during which 5 hot flashes were recorded.

Physical Findings

During a progress examination conducted on 9/20/93, the patient indicated that the weakness and tingling in the left arm was no longer present. Dermatome and deep tendon reflex abnormalities noted on presentation were absent. The neck flexor muscle group was strong on manual muscle testing. Although no adjustments had been administered below the level of T2, the patient demonstrated no hypomobility at the T5-T6 and right sacroiliac motion segments.

At the close of the study, a concluding physical assessment revealed a normal cervical extension and improved left lateral flexion. Motion palpation revealed normal mobility at the C2-C3 and L3-L4 motion segments, although some T1-T2 fixation remained. The patient rated her neck pain at 2.2 cm on the VAS previously described.

Discussion

It is apparent from the results of this case study, that the decline in perimenopausal hot flashes was associated with the adjustment regimen. Noteworthy is the consistent decline in frequency of hot flash episodes paralleled to adjustment intervals throughout the study, especially when compared to baseline. The number of hot flash free days is also notable and closely linked to the overall care regimen.

A leveling off effect in the mean number of reported hot flashes occurred following the sixth adjustment. This would

appear to mark the patient's maximum response in terms of hot flash reduction. Curiously, complete resolution of several somatic sensory and motor signs were also evident during the 9/20/93 progress examination, more than two weeks prior to the sixth adjustment. This apparent lag prior to the maximum hot flash reduction response may reflect the multivariate nature of vasomotor regulation as compared to the more localized control of such functions as dermatome sensation and deep tendon reflexes.

The resolution of certain findings of the physical examination suggest that the adjustment regimen was effective. This also suggests that the physiological changes associated with reduction in hot flashes could be affected by the adjustments. Additionally, since virtually all of the initial physical examination findings were resolved by the end of the study as well as a significant reduction in the occurrence of hot flash episodes, the same conclusion is further supported.

An outstanding feature of the initial physical examination of this patient was the extent to which physical signs pointed to cervicothoracic vertebral subluxation. These signs included T1-T2 hypomobility on motion palpation, asymmetry at the T1 dermatome level, and asymmetry of the triceps reflex. This leads to speculation regarding how cervicothoracic subluxation could be related to hot flashes.

Recent research has indicated that the stellate ganglion is largely responsible for cutaneous vasomotor control of the face.[13] This ganglion is a consolidation of the lower cervical and upper thoracic portions of the paravertebral chain ganglion. Commonly, the stellate ganglion straddles the first rib near the costovertebral junction and provides major sympathetic innervation to the upper extremity.[14] Cervicothoracic subluxation, may therefore, have affected this patient's hot flashes by irritating the stellate ganglion. It is also plausible that the patient's initial complaint of weakness and tingling in the left arm was also attributable to irritation of the stellate ganglion.

With the patient's prevalence of upper cervical subluxation throughout the study, some mention must be made regarding the superior cervical sympathetic ganglion. This structure is a swelling of the paravertebral chain ganglion at the level of occiput-C2, and supplies sympathetic innervation to the blood vessels of the inner cranium, including those of the hypothalamus and pituitary gland.[15] This neuro-endocrine junction is the primary locus of control over the events of the menstrual cycle and menopause. Irritation to the superior cervical ganglion due to upper cervical misalignment and subsequent tissue aberrations, could disturb hypothalamic and pituitary function. This could subsequently exacerbate the physiological changes of menopause resulting in an increased symptomatic profile in the patient.

Cranial somatic dysfunctions were also found in the patient. It is believed that these cranial dysfucntions may have exacerbated the patient's vertebral subluxations due to the influence of cranial motion on the flow of cerebrospinal fluid and dural mechanics. These phenomena are tenets of both chiropractic and osteopathic theory, recently supported through magnetic resonance imaging study.[16] While it is postulated that the effects of cranial somatic dysfunctions are secondary to vertebral subluxation regarding hot flashes, it is apparent in the present study that the effects of removing cranial dysfunctions may have influenced the reduction of hot flashes independent of vertebral subluxation correction. Since the extent of such an effect is not known, it is apparent that future studies will require evaluation of similar cases without correction of cranial dysfunctions, or without correction of vertebral subluxation, to ascertain the extent of influence over hot flashes of these two conditions, independently.

It is interesting to note that the patient's mid-thoracic and sacroiliac dysfunctions were reduced, even though these areas were not adjusted during the study period. It is possible that the mid-thoracic and sacroiliac subluxations were caused or exacerbated by dural torque or cord deformation at higher segmental levels. Consequently, correction of vertebral subluxation ranging from the occiput to T2, may have facilitated correction of the mid-thoracic and sacroiliac dysfunctions. The thoracic and sacroiliac corrections may also represent the influence of the strong postural reflexes of the cervical spine on the rest of the vertebral column, noted by other investigators. [17,18]

Hot flashes are generally self limiting, so it is necessary to consider that some portion of the patient's improvement was natural. However, the precipitous nature of the amelioration coupled to the strong parallel to the adjustment regimen, appears to be more consistent with a genuine physiological benefit from the adjustment care, in our opinion and that of the patient. Future studies are required before vertebral subluxation can be more directly implicated in exacerbation of hot flashes. It is proposed that future studies could be strengthened by the inclusion of thermographic analysis to monitor changes in paraspinal vasomotor tone concomitant with amelioration of hot flashes.

While menopause is a natural life event, much of the attendant distress may be avoidable through the correction of vertebral subluxation. Progress in this area could enhance the quality of life for women experiencing this transition.

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