

# Pressure algometry and tissue compliance measures in the treatment of chronic headache by spinal manipulation: a single case/single treatment report

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*A single-case study of chronic bilateral headache is presented with data provided on pressure algometry, visual analogue scale (VAS), and tissue compliance assessment, the former two measured pre-and-post-manipulation. Pre-treatment recordings demonstrated correlation of findings of joint and muscle dysfunction in the upper cervical spine in this headache sufferer. Post-treatment recordings demonstrated improvements not only in the local spinal tissues but in the distal referred pain pattern (i.e. headache). This case is discussed in regard to both the methods of assessment of soft tissue dysfunction and the theories correlating spinal joint dysfunction with myofascial pain and their relief with manipulation.*  
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**KEY WORDS:** headache, upper cervical, pressure algometer, tissue compliance, manipulation, chiropractic.

*L'étude d'un cas de céphalée bilatérale chronique est présentée avec les données obtenues par un algomètre à pression, une balance visuelle analogue (VAS) et l'évaluation de compliance tissulaire, les deux premiers ayant été mesurés avant et après manipulation. Les données pré-traitement ont démontré une corrélation entre les résultats relatifs à la dysfonction articulaire et musculaire dans la région supérieure de la colonne cervicale chez ce patient souffrant de céphalée. Les données post-traitement ont démontré des améliorations non seulement dans les tissus spinaux locaux, mais aussi dans la présentation de douleur distale (c.-à-d. céphalée). On discute du cas en ce qui a trait aux méthodes d'évaluation de la dysfonction des tissus mous et des théories relatives à la dysfonction d'articulation spinale avec douleur myofasciale et leur soulagement par la manipulation.*  
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**MOTS CLÉS:** céphalée, région supérieure cervicale, algomètre à pression, conformité des tissus, manipulation, chiropratique.

## Introduction

Our present knowledge of spinal pain syndromes is not yet so adequate that we can precisely distinguish the role of dysfunction of articular structures as opposed to that of the myofascial elements. The view in some circles is a dichotomous one, in which joint and muscle structures are treated separately – thus leading to such concepts as “trigger points” being considered solely a myofascial phenomenon, while joint strains are purely of articular concern, with no impact on muscle function. Others find this dichotomy artificial and, in some sense, irrelevant given that the object of treatment is the anatomical/functional unit as a whole. Myofascial pain specialists, generally subscribers to the former view, have elevated the myofascial tender point to its rightful place in the musculoskeletal pathophysiological

model<sup>1,2,3</sup> and have devised reliable methods of quantifying its presence and its extent.<sup>4,5,6</sup> Unfortunately, they have typically found it unnecessary to explore deeper into the sub-jacent articular structures, which have, apparently, been the ‘bailiwick’ of chiropractors. We say apparently because the role of muscle structures has never been lost in chiropractic pathophysiological models, and, in fact, in some, it predominates. Sadly, the dog still chases its own tail.

Single case studies which accurately quantify the coexistence of myofascial tender points, sub-jacent articular dysfunction, and painful symptoms can help shed some light on these issues,<sup>7,8</sup> which eventually ought to be explored in larger controlled studies.

The following is a report of a case, interesting because the pain syndrome associated with the spinal dysfunction was a chronic bilateral frontal headache. In other words, this case represents a distant and possibly unapparent connection between the symptoms and the underlying disorder. The notion of referred “headache” pain from suboccipital myofascial and articular structures (or lesions in them) is quite old. In fact, a

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multitude of empirical reports exist in the literature of all the disciplines involved in manipulation (see review in Vernon<sup>11</sup>) on the connections between upper cervical dysfunction, headache and relief by manipulation.

However, very few reports provide objective quantification of the myofascial component (tenderness, and increased stiffness (i.e. hypertonicity) and its association with the articular component (motion blockage or fixation). Jaeger<sup>13</sup> has recently reported on a small case series in which disturbances measured by algometry, motion and static palpation and cervical spine gross ranges of motion have been associated with headache. Bogduk<sup>14</sup> has reported on the association between motion palpation and facet injection such that the results of injection therapy improved when specifically targeted to the spinal joint segment level identified as blocked on motion palpation. This work follows closely from that of Jull,<sup>15,16</sup> in which headache and non-headache groups were distinguished by the higher prevalence of fixations in those with headaches.

### Methods and results

A 39-year-old married, female occupational health nurse presented with a 25 year history of headaches. The predominant headache mode was a daily, bilateral frontal aching pain which conformed to the classification of chronic muscle contraction headache (MCH). The patient was symptomatic when presented to the clinic and had been so for the previous six hours. Her chronic condition was punctuated by very infrequent episodes of more acute severe headaches, which in the past have been preceded by aura-like phenomena and which had been labelled as migraines. She had not suffered one of these headaches for eight years although she had the occasional severe variation of the MCH. She also complained of chronic neck and upper back pain, but the headache was not described as part of this cervical pain condition. The patient had been under long-term chiropractic care which she acknowledged was the only source of relief she had obtained. Treatment had apparently reduced the overall severity of the headaches and had prevented the severe attacks almost completely. She was referred to our specialty clinic for evaluation of any perpetuating factors which might not previously have been detected.

Postural evaluation revealed a forward head carriage with shrugged shoulders. Inspection and palpation revealed hypertonicity in the upper trapezius muscles bilaterally, worse on the right, as well as in the suboccipital muscles, again worse on the right. Tender points (TP) were detected in each of these muscles, with the right-side points being more tender than those on the left. Motion palpation revealed a major fixation at C1-C2 on the right, so that a complex of findings – restriction of anterior rotation of atlas, palpable spasm and local tenderness of the ipsilateral suboccipital muscles – appeared to be the major clinical finding.

Two methods of quantifying the myofascial component in this type of disorder are pressure threshold algometry and tissue compliance assessment. Both of these methods have been intro-

duced by Fischer, who has reported extensively on reliability and normative data of these clinical instruments.<sup>4,5,9</sup> We have also reviewed the method of pressure algometry and have shown its usefulness in studies of the effects of spinal manipulation.<sup>7,8</sup> Tissue compliance assessment is a variation of pressure algometry which purports to measure the stiffness of the soft tissues – an objective finding which does not require the patient's participation in the measurement. The tissue compliance meter (TCM) measures the depth of penetration of the pressure plunger into the surface of the soft tissues at various levels of force, so as to detect the relative stiffness of these tissues. Force/penetration graphs are obtained for 2, 3 and 4 kg/cm<sup>2</sup> force levels (see figures 1 and 2). The normal values reported by Fischer<sup>9</sup> for the upper trapezius muscle are 12, 14 and 17 mm, for 2, 3 and 4 kg/cm<sup>2</sup> levels, respectively. The critical criteria in pressure algometry (tenderness) are such that values below 3 kg/cm<sup>2</sup> are clinically significant, as well as any bilateral difference which exceeds 1 kg/cm<sup>2</sup>.<sup>4,5</sup>

Pressure algometry, TCM and VAS (visual analogue scale) scores were conducted in this case, the results of which are presented in Table 1. The clinically relevant findings were the increased stiffness (or hypertonicity) of both upper trapezius muscles, the right being worse than the left, and the significant reduction of the pressure threshold in the medial occiput point on the right (corresponding to the insertion of rectus capitis

Table 1 ASSESSMENT PROFILE

#### 1 – Tender Points (kg/cm<sup>2</sup>)

	Pre-Rx L	R	Post-Rx R
Medial-occipital	5.0	1.5	2.3
Sub-occipital	2.0	1.5	
Trapezius	1.5	1.6	
Scalenes	1.5	1.0	

#### 2 – Muscle Compliance (pre-treatment only)

	Normal	R	L
Trapezius – 2 kg	12	6	8
– 3 kg	14	8	10
– 4 kg	17	9	11

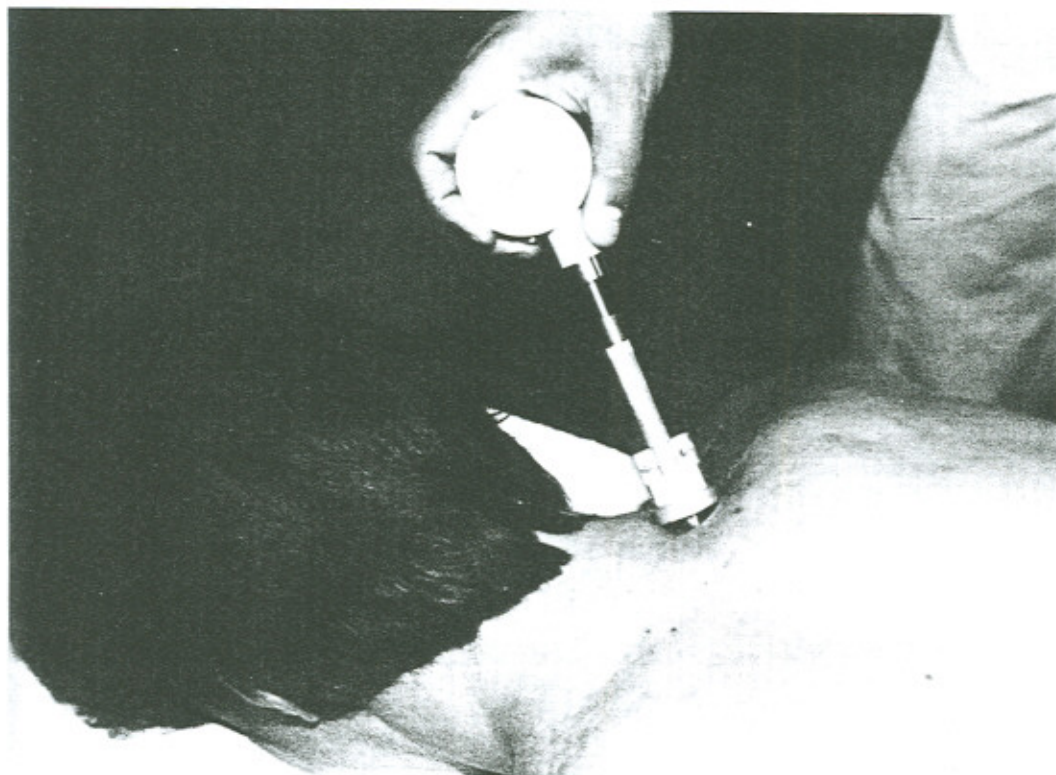
#### 3 – VAS (mm)

	Pre-Rx	Post-Rx
	63	14





**Figure 1** Pressure algometer used over occipital tender point.



**Figure 2** Tissue compliance meter used on trapezius muscle.



posticus minor from C1-C0). These findings quantitatively corroborate those clinical findings noted previously, namely – increased hypertonicity of the trapezius muscle upon digital palpation and increased tenderness to digital pressure of the suboccipital muscles (trigger point) on the right. During the history taking, the patient was asked to rate her present headache intensity on a standard 10cm VAS whose left and right anchors were “no headache” and “worst headache imaginable” respectively. Her VAS score was 63 (on the 100mm scale).

A rotational manipulation of atlas-axis (see Szaraz<sup>10</sup>) was performed and the medial occiput TP was remeasured after five minutes of rest. The post-treatment value was 2.3 kg/cm<sup>2</sup> which represented an increase of 53%. Just prior to leaving the clinic she was asked to score her headache again on the VAS. An interval of approximately 15 minutes had elapsed. She scored 14, which represented approximately 80% improvement. Tissue compliance data was not obtained post-treatment.

### Discussion

In our previous small randomized controlled study of the effects of manipulation on cervical tender points, we reported an average 45% increase in pressure threshold in manipulated subjects, as compared to those receiving a sham mobilization.<sup>8</sup> In a single-case study, Vernon reported that manipulation resulted in pressure threshold increases in seven cervico-thoracic muscles, which also averaged 45%.<sup>7</sup> The “present pain ratings” in that subject were also reported to decrease from 6 to 1 after treatment.

Of importance in the present case is the fact that the pre-treatment algometry and TCM measures revealed a correspondence between joint dysfunction at C1-C2, local myofascial tenderness and related muscular hypertonicity. Treatment of this focal joint dysfunction by manipulation resulted in rapid, short-term improvements in tenderness and “present pain” in this headache subject, which are remarkably similar to those obtained in the subjects previously described.

The clinical result reported here is consistent with a great number of studies reporting relief of headache and neck pain by spinal manipulation (see reviews in Vernon et al,<sup>8</sup> and Vernon<sup>11</sup>).

Although the quantitative measurements in this single-case study were obtained in an unblinded fashion, cautious interpretation is always urged. However, even these data would corroborate the common anecdotal experience of most clinicians, that pain, tenderness and spasm in the soft tissues are often accompanied by focal joint dysfunction (typically related neuromerically<sup>12</sup>) and that these symptoms and signs are often improved after spinal manipulation.

### Conclusion

Quantification of clinical findings reported in a single-case study is important both because it adds precision to the diagnosis

and because generalization of the findings in this type of case report can also aid in the verification of important components of the manipulation paradigm. In this paradigm, joint and muscle dysfunctions are correlated, and manipulation results in improvement in the clinical behaviour of the functional unit. In this case, a referred pain – bilateral frontal headache – was shown to decrease in correspondence with reductions in local spinal soft tissue tenderness after a spinal manipulation to the related segment.

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