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Pressure pain threshold evaluation of the effect of spinal manipulation on chronic neck pain: a single case study

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A single case study is presented in which the use of the pressure pain threshold meter (PPT) allows for the objective evaluation of the treatment effect of spinal manipulation. A 22 year old male with a five year history of right-sided neck, scapular and arm pain demonstrated an average of 45.7% increase in PPT readings in maximal tender points after spinal manipulation. The results are discussed in light of current theories of pain mechanisms related to spinal manipulation. (JCCA 1988; 32(4): 191–194)

KEY WORDS: tender point, pressure pain threshold, manipulation, chiropractic.

L'étude d'un case isolé présentée, pour laquelle l'utilisation d'un compteur du seuil de douler à la pression (SDP) a permis d'évaluer de facon objective les effets d'un traitement par manipulation de la colonne vertébrale. Un patient masculin de 22 ans, ayant à son actif cinq années de douleur au bras et à l'omoplate avec un cou coincé vers la droite, a montré un accroissement moyen en indices de SDP de 45,7% aux points les plus sensibles à la suite d'une manipulation spinale. Ces résultats sont discutés en fonction de théories récentes sur les mécanismes de douleur liés de colonne vertébrale. JCCA 1988; 32(4): 191–194)

MOTS-CLÉ: point sensible, seuil de douleur à la pression, manipulation, chiropraxie.

Introduction

Reports of the objective evaluation of the effect of spinal manipulation on clinical pain states are scarce. The clinical trials reported since 1974 (see reviews by Brunarski[1], Ottenbacher and Difabio[2], Deyo[3]) give evidence of an important benefit obtained in patients who receive spinal manipulation. However, amongst a number of methodological concerns, these studies are generally based on self-reports of relief of pain and are subject to a variety of non-specific influences. The introduction of objective methods of evaluating the kind of clinical pain states suffered by the majority of patients treated by chiropractors[4] would be an important improvement.

In this case report, we use the Pressure Pain Threshold meter† (PPT) to provide objective evidence of pain relief obtained in a single chiropractic treatment. The protocol for the use of the PPT, as well as normative and reliability data have been reported extensively by Fischer[5] and Jaeger et al[6]. The device is intuitively attractive to the chiropractic clinical setting as it measures tenderness to pressure in the deeper myofascial structures. This gives it a distinct advantage over skin-rolling[7] and electrical pain stimulators[8] in evaluating the structures more typically of clinical interest to chiropractors.

Methods

A single-case study is presented of a 22 year old Caucasian male with a five (5) year history of chronic neck, scapular and arm pain on the right side. The patient is a hairdresser, and so an occupational context to his problems was recognized in that he worked with his arms up and out while standing for hours at a time. He was referred to our Specialty Clinic with a diagnosis of unilateral thoracic outlet syndrome. While this was confirmed with photo-plethysmographic investigation[9] the involvement of joint and myofascial dysfunction was broadened to include a diagnosis of concommitant unilateral scapulo-costal pain syndrome. In the chiropractic assessment the following significant findings were noted: The patient pointed to areas of maximal pain over the trapezius muscle and in the mid-cervical area on the right. He localized point tenderness in the right trapezius and levator scapula tender points (TP)[10], as well as a tender point in the right mid-cervical paraspinal region. (see Figure 1) Palpable hypertonicity was found in these underlying muscles on the right side, especially the trapezius and levator scapula.

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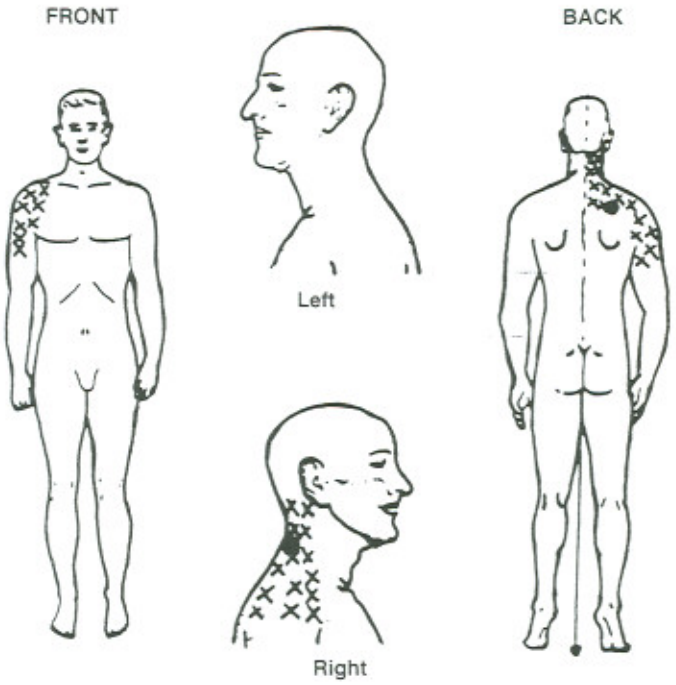

Figure 1 The pain diagrams.

Motion palpation[11] revealed joint dysfunction (fixations) at C2-C3, T2-T3 and in the right scapula (this latter finding from restricted joint play movements[12]). The patient was asked to score his present pain on a standard visual analogue scale (VAS), scoring a 6 on a scale from 0–10.

Table I displays the PTT findings in seven standard TP's prior to treatment. The author uses the following pressure pain threshold technique: The patient is oriented to the PPT (see Figure 2) Instructions as to how to indicate the threshold level of tenderness are given. Simply stated, the PPT is placed perpendicularly over the contact area. Even pressure is applied so as to increase the load by one or two kg/cm^2 per

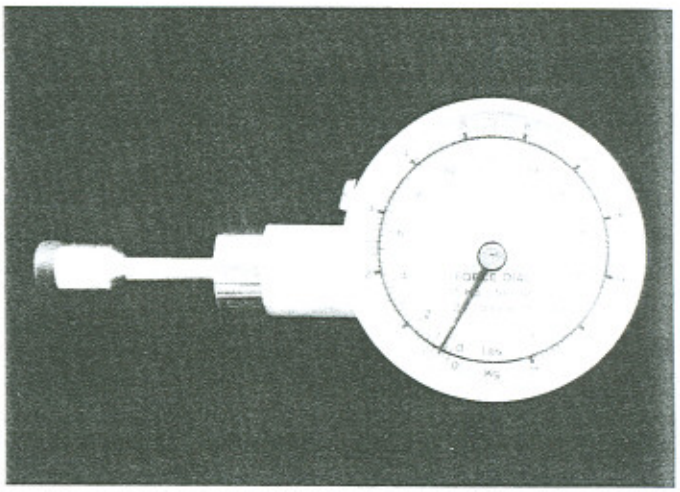

Figure 2 The pressure threshold meter.

second. The patient is asked to indicate the point at which the sensation of pressure changes to tenderness. They do this by saying "now". This point is the pressure pain threshold point, and has been used by Fischer and his colleagues as the critical diagnostic parameter[5]. A trial run is performed on the lateral forearm extensor muscles to acquaint the patient with the procedure. The patient then lays prone on the adjusting table with the headpiece tipped forward. The most effective technique is to use the maximum tender point which is located first by digital palpation. Once identified, the PPT is then placed perpendicular to the surface and even pressure is applied for the measurement. (see Figure 3, a and b) Measurements are made unilaterally at all of the relevant TP's; then the contralateral side is measured so as not to induce a comparison/order bias in the patient. Treatment consisted of two adjustive manipulations – a scapular stretch technique with an audible release on the right, and an anterior thoracic adjustment of T2-T3 on the right. The patient had never before received chiropractic treatment. He was instructed to relax

Table 1 Pre-treatment PTT measurements

Tender Point	*PTT value (kg/cm^2)*	
	Left	Right
Medial occiput	2.3	1.4
Lateral occiput	3.0	2.0
Sub-occipital	3.1	1.5
Mid-cervical	3.3	2.1
Trapezius	4.2	2.6
Levator scapula	3.2	1.9
Rhomboid	4.0	2.6
Average	3.3	2.01

Table 2 Post-treatment comparison of right TP's

Tender Point	*PTT value (kg/cm^2)*	
	Pre	Post
Medial occiput	1.4	2.3
Lateral occiput	2.0	2.1
Sub-occipital	1.5	2.5
Mid-cervical	2.1	2.6
Trapezius	2.6	3.9
Levator scapula	1.9	3.2
Rhomboid	2.6	3.7
Average	2.01	2.90
Average increase = 45%		

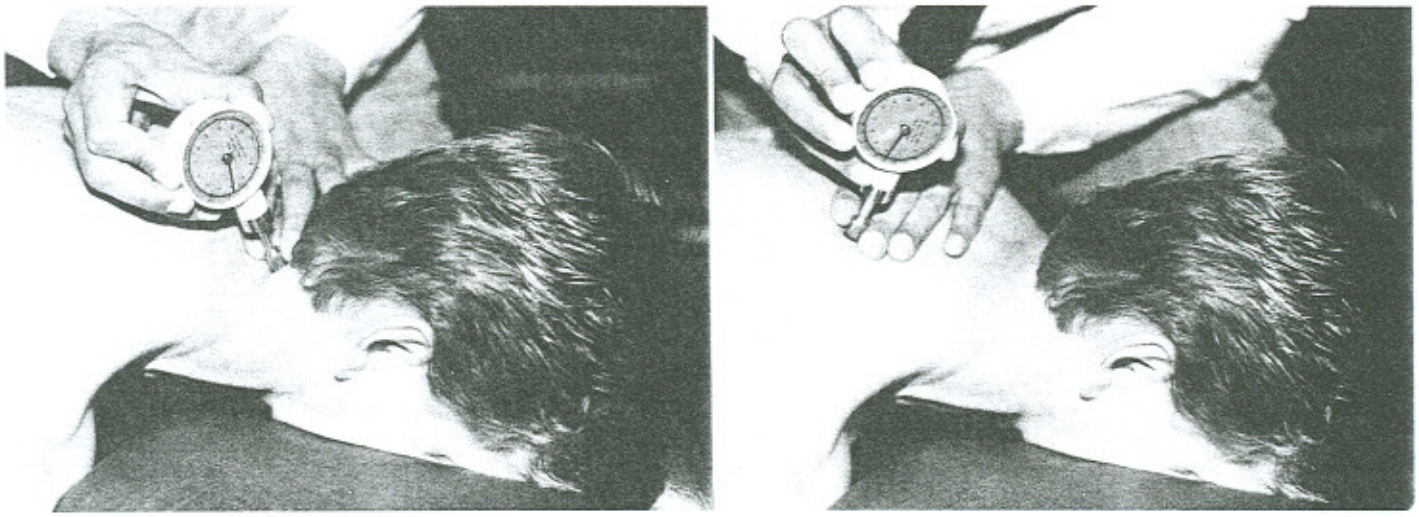

Figure 3 Application of the pressure threshold meter. a. mid-cervical. b. levator scapula.

supine for five (5) minutes, whereupon the PTT for the right-sided TP's was redone. He denied experiencing any pain during the manipulations.

Results

The post-treatment PTT values are shown in Table II. The largest increases in pressure pain threshold occurred in the TP's of the scapular muscles. The average increase at all seven (7) TP's was 45.7%. The mobility of the T2-T3 fixation palpated as greatly improved, while the right scapula palpated as moderately more mobile after the treatment. The post-treatment VAS was 1. The patient indicated verbally, that he felt significantly better, even in his general mood state.

Discussion

This single-case study gains some generalizability from the following aspects: the patient was totally naive to adjustive treatment, and so, had no preconceptions about the effect such treatment might have. The complaint was long-standing and no relief had previously been obtained. The complaint was quite typical of those seen by chiropractors and others in "physical" or manual medicine. It bears pointing out that the chiropractic assessment identified findings of *both* muscle and joint dysfunction and that these are, arguably, concommitant, both in their shared location, and in specific linkages of discrete muscles to discrete joint sites (i.e. C2-C3 to scapula – for levator scapula, T2-T3 fixation subjacent to trapezius TP). This is in distinction to the findings of "myofascial pain specialists" who omit joint dysfunction assessment.

Without the PPT measurements this presentation would be no more than an anecdotal report of a chiropractor's palpatory findings and opinions about the patient's status. In other words, a mundane report of anecdotal improvement typical of that which we commonly encounter in practice. With the addition of the objective findings, the palpatory findings of fixation and hypertonicity are given a quantitative context which matches the patient's subjective complaint. The improvement post-adjustment is verified objectively and quantitatively. Variations in treatment effect can be discerned between various areas within the region of pain (i.e. upper cervical vs scapular).

Finally, quantitative evidence is forthcoming which adds to the data which supports certain theoretical explanations regarding the beneficial effects of spinal manipulation. These have been advanced (and reviewed) in recent studies by the author[8,13] and most recently by Gillette[14] and Zusman[15]. The controversy exists in accepting the "afferent bombardment model" originally proposed by Korr[16] and Wyke and[17] and elaborated by many others[18,19,20].

In our first study[8] we demonstrated an increase in cutaneous pain tolerance to electrical stimulation which was significantly greater after a spinal manipulation as compared to a joint mobilization. The mean increase in pain tolerance at five minutes in that study was 100%, while at 10 minutes it was 140%. The case presented here demonstrates that a similar pattern is obtained when PPT is conducted in the deeper tissues. Since the manipulations were not painful, we continue to maintain that the most tenable explanation for these findings lies in changes in spinal cord reflexes produced by bombardment of Type I and/or Type II afferent input from the myofascial and articular low threshold mechanoneceptors. The phenomenon of manipulation-induced plasticity of spinal reflex mechanisms is essentially the opposite of those which have been demonstrated in the presence of, or as an effect of, painful input of nerve, muscle and to a lesser extent cutaneous experimental lesions. (See Wall and Woolf, 1984).[21]

Where pain is excitatory, producing long-term potentiation of motoneurons and pain-transmitting spinal cord centers, (i.e. the "central facilitation" of Korr[22]), manipulation exerts inhibitory influences thereby producing salutory clinical effects.

Conclusion

The PPT assessment has been shown to be useful not only as previously reported in the objective evaluation of clinical pain status, but now, in the objective demonstration of relief of pain by spinal manipulation. Larger group studies are necessary to confirm these findings and to substantiate the current theoretical models of manipulation-induced effects.

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