

Clinical reasoning for manual therapy management of tension type and cervicogenic headache

César Fernández-de-las-Peñas^{1,2,3}, Carol A. Courtney⁴

¹Department Physical Therapy, Occupational Therapy, Rehabilitation and Physical Medicine, Universidad Rey Juan Carlos, Madrid, Spain, ²Esthesiology Laboratory of Universidad Rey Juan Carlos, Madrid, Spain, ³Cátedra de Investigación y Docencia en Fisioterapia: Terapia Manual y Punción Seca, Universidad Rey Juan Carlos, Madrid, Spain, ⁴Department of Physical Therapy, University of Illinois at Chicago, USA

In recent years, there has been an increasing knowledge in the pathogenesis and better management of chronic headaches. Current scientific evidence supports the role of manual therapies in the management of tension type and cervicogenic headache, but the results are still conflicting. These inconsistent results can be related to the fact that maybe not all manual therapies are appropriate for all types of headaches; or maybe not all patients with headache will benefit from manual therapies. There are preliminary data suggesting that patients with a lower degree of sensitization will benefit to a greater extent from manual therapies, although more studies are needed. In fact, there is evidence demonstrating the presence of peripheral and central sensitization in chronic headaches, particularly in tension type. Clinical management of patients with headache needs to extend beyond local tissue-based pathology, to incorporate strategies directed at normalizing central nervous system sensitivity. In such a scenario, this paper exposes some examples of manual therapies for tension type and cervicogenic headache, based on a nociceptive pain rationale, for modulating central nervous system hypersensitivity: trigger point therapy, joint mobilization, joint manipulation, exercise, and cognitive pain approaches.

Keywords: Tension type headache, Cervicogenic headache, Pain, Sensitization, Spine, Trigger points, Manual therapy

Introduction

In the twenty-first century, headaches are very common and cause substantial pain and disability. Headache is probably the most common problem seen in clinical practice by health care professionals, with tension type, cervicogenic headache, and migraine as the most common forms.¹ These headaches are associated with a high burden of suffering and considerable socio-economic costs.²

Several therapeutic approaches have been proposed for the management of headaches with pharmacological drugs, physical therapy, and relaxation/cognitive therapies the most commonly used.³ The clinical guidelines on the treatment of tension-type headache by the European Federation of Neurological Societies concluded that conservative non-drug management, i.e. physical therapy and acupuncture, should always be considered although their scientific basis is still limited.⁴ A national study conducted in the USA

revealed that alternative medicine therapies are the most utilized treatments requested by individuals with headaches.⁵ In fact, manual therapies are the therapeutic strategy most requested by patients with tension type headache.⁶

In this paper we will discuss: (1) the scientific evidence for manual therapies in tension type and cervicogenic headache; (2) the clinical variables that may identify patients with tension type and cervicogenic headache who will benefit from manual therapies; (3) the presence of sensitization mechanisms in tension type and cervicogenic headaches; and (4) manual therapies proposed for headaches based on a nociceptive pain rationale.

Scientific Evidence for Manual Therapy in Tension Type and Cervicogenic Headache

There are several manual therapies proposed for the management of tension type and cervicogenic headache: spinal manipulation, massage, stretching, connective tissue, myofascial induction, dry needling, spinal mobilization, or neuromuscular approaches.⁷ A survey conducted in Australia reported that probably spinal joint mobilization and/or manipulation

Correspondence to: C Fernández-de-las-Peñas, Facultad de Ciencias de la Salud, Universidad Rey Juan Carlos, Avenida de Atenas s/n 28922, Alcorcón, Madrid, Spain. Email: cesar.fernandez@urjc.es

are the manual therapies most commonly used by physical therapists.⁸

In fact, several systematic reviews have investigated the effectiveness of spinal manipulation in the management of tension type, migraine, and cervicogenic headache. The results of the reviews are inconsistent, since the effectiveness of joint manipulation in tension type headache remains inconclusive,⁹ current evidence does not support the use of manipulation for migraine,¹⁰ whereas some positive results have been found for cervicogenic headache.¹¹ In fact, a review of systematic reviews concluded that the findings reported about effectiveness of spinal manipulation for the management of headaches differed considerably.¹² Further, we observed that the methodological quality of the randomized controlled trials analyzing the effectiveness of spinal manipulation and/or mobilization for headaches is typically low.¹³ Nevertheless, evidence-based guidelines recommend the application of spinal manipulations for migraine and cervicogenic headache, but not for tension type headache.¹⁴

The use of spinal manipulations, particularly of the neck, remains controversial because of the reported adverse reactions and subsequent concerns about safety. These reported adverse reactions range from minor conditions, e.g. stiffness, increased pain, and limitation in motion,¹⁵ to more serious injuries including permanent neurological deficits, dissection of carotid or vertebral arteries, and death.^{16,17} In truth, adverse effects are poorly reported in randomized controlled trials of manipulations.¹⁸ Despite the potential for post-manipulative adverse reactions, there is some evidence suggesting that, if all contraindications and red flags are ruled out, there is potential for a clinician to prevent 44.8% of adverse events associated with cervical manipulation; however, 10.4% of the events are unpreventable, suggesting an inherent risk associated with neck manipulation even after a thorough exam and proper clinical reasoning.¹⁹

Other therapeutic strategies, e.g. massage, compression, and stretching, are targeted to treatment of soft tissues of the body. Fernández-de-las-Peñas *et al.* found no rigorous evidence that manual therapies including both spinal manipulation and soft tissues have a positive effect in the evolution of tension type headache.²⁰ In contrast, Chaibi and Russell have recently concluded that manual therapies might be an effective treatment for cervicogenic headache, although this conclusion should be considered with caution at this stage.²¹ Nevertheless, it is important to recognize that any systematic review has positive conclusions, although several high-quality randomized controlled clinical trials investigating soft tissue interventions reported positive outcomes. Quinn *et al.* found that muscle-specific massage therapy was a

non-pharmacological intervention effective for reducing tension type headache.²² A recent study reported that manual therapy is more effective than usual general practice care in reducing symptoms of chronic tension type headache.²³

These inconsistent results can be related to the fact that maybe not all therapeutic interventions are appropriate for all types of headaches; or maybe not all patients with headache will benefit from manual therapies. For instance, studies demonstrating that spinal manipulations were effective for tension type headache included patients with the chronic condition; therefore, spinal joint manipulation may be more effective in chronic than in episodic tension type headache.⁹

Identification of Potential Clinical Variables in Tension Type and Cervicogenic Headache

The equivocal results reported by previous studies investigating manual therapies into headaches might be attributed to the fact that the studies did not identify sub-groups of patients who are most likely to benefit from these specific interventions. It has been suggested that not all patients with headache will benefit from manual therapy.²⁴ In line with this hypothesis, some studies had tried to identify the potential prognostic variables to guide manual therapy interventions in patients with headaches.

Niere found that a higher frequency of attacks predicted a positive response of patients with cervicogenic headache to manipulative therapy.²⁵ Fleming *et al.* reported that age and provocation or relief of headache with movement were predictor factors associated with better outcomes in patients with cervicogenic headache.²⁶ Alternatively, Jull and Stanton did not find any consistent pattern of variables in patients with cervicogenic headache.²⁷

Fernández-de-las-Peñas *et al.* performed a pilot study to try to identify patients with tension type headache who experience a positive outcome after the application of trigger point manual therapy.²⁸ This study identified that shorter headache duration (<8.5 hour/day), shorter headache frequency (<5.5 days/week), less body pain, and lower vitality was associated with better outcomes.²⁸ If three of four variables were present, the chance of experiencing a successful outcome improved from 54% to 80%, whereas if all the variables were present, the probability of success was 87.4%.²⁸

In a later study, eight prognostic variables were identified that could identify women with tension type headache who were likely to experience short-term improvement with a multimodal session including joint mobilizations and trigger point manual therapy: younger age (<44.5 years old), presence of active trigger points in the suboccipital, superior oblique, sternocleidomastoid, or upper trapezius muscle, restricted cervical

rotation, lower tenderness, and disability.²⁹ A recent study identified that prognostic factors related to a better outcome in tension type headache were co-existing migraine, absence of multiple-site pain, greater cervical range of motion, and higher headache intensity.³⁰ It seems that patients with lower degree of sensitization and less impairment in the cervical spine will benefit to a greater extent from manual therapies, although further studies are clearly needed.

Sensitization Mechanisms in Tension Type and Cervicogenic Headache

In recent years, there has been an increasing interest in nociceptive mechanisms in headaches. A mechanism-based classification or understanding of sensitization pain syndromes is based on the hypothesis that different clinical signs and symptoms reflect different underlying pathophysiological mechanisms of pain generation.³¹

The hyperalgesic and allodynic responses seen in individuals with tension type headache support the role of peripheral and central mechanisms in the development of the clinical picture of pain.³ It has been suggested that both hyper-excitability of the central nervous system and a reduction in inhibitory mechanisms are involved in tension type headache.^{32,33} The most accepted theory is that the main problem in tension type headache is central sensitization due to prolonged peripheral nociceptive inputs from peripheral tissues.³⁴ The role of central sensitization has been also discussed in patients with cervicogenic headache,³⁵ although it seems that its clinical manifestations are less relevant than in individuals with tension type headache, since no widespread pressure pain hypersensitivity is present in this headache, at least in elder people.³⁶

The presence of central sensitization in tension type and cervicogenic headache has been proposed as a prognostic factor for manual therapy; however, the relationship between central sensitization and physical therapy is complex, as central sensitization is not always associated with a poor outcome. For instance, it has been found to be a poor prognostic factor for physical therapy in individuals with chronic whiplash associated disorders, since widespread pressure hypersensitivity and cold hyperalgesia were associated with a poor response to physical therapy.³⁷ In contrast, Fernández-de-las-Peñas *et al.* reported that the presence of peripheral sensitization, instead of widespread central sensitization, was related to a positive physical therapy response in women with carpal tunnel syndrome.³⁸

Current data support the role of central sensitization in headaches, particularly tension type headache. However, since central sensitization is generated by prolonged nociceptive inputs from

peripheral structures³⁹ and dynamically influenced by activity and location of these nociceptive inputs,⁴⁰ the role of peripheral mechanisms should be not ignored. Herren-Gerber *et al.* found that injection of lidocaine in tender points in the neck of patients with whiplash decreased pressure pain hypersensitivity depending on the effect of injection on ongoing pain.⁴¹ Staud *et al.* found that a single intramuscular anesthetic injection into the upper trapezius significantly increases pain thresholds and decreases remote secondary heat hyperalgesia in fibromyalgia.⁴² These studies support the notion that central sensitivity can be modulated by decreasing peripheral nociceptive input. We had recently reported normalization of widespread pressure pain hyperalgesia after successful hip joint replacement in individuals with painful hip osteoarthritis supporting that altered pain processing seems to be driven by ongoing peripheral nociceptive pathology.⁴³

Manual Therapy Strategies for Headaches

Current research is encouraging a paradigm shift in clinical decision-making away from the traditional tissue-based models of pain towards a more comprehensive biopsychosocial model.^{44,45} This model encompasses more than just the biological factors (i.e. anatomy, physiology, and neurophysiology) in headaches, by addressing the psychological (i.e. thoughts, emotions, and behaviors) and social (i.e. work and playing status, culture, and religion) factors which are known to play a significant role in headaches.

It has been suggested that greater knowledge is needed to understand the impact of abnormal sensory features on the effectiveness of physical therapy before any treatment is conducted. The challenge facing clinicians is how to select the proper treatment approach for each patient with headache, who is likely to be different in their clinical presentation. In choosing the proper management, consideration must be given to properly interpreting the manifestations of peripheral and central sensitization mechanisms involved in headaches.⁴⁶ Further, neurophysiologic and tissue mechanisms underlying the effects (positive, negative) of any intervention should be also considered. Therefore, clinical management of patients with tension type and cervicogenic headache needs to extend beyond local tissue-based pathology, to incorporate strategies directed at normalizing or reducing central nervous system sensitivity (as previously discussed). The existence of a wide range of manual therapies that have been advocated in the management of headaches is an indication that no one treatment has proven superiority and, likely is a product of an inconclusive understanding of the underlying pathology of head pain.



Figure 1 Manual therapy addressing trigger points in the sternocleidomastoid muscle. The fingers of the therapist grasp the taut band from both sides with a pincer palpation, and stroke centrifugally away from the TrP.

Therefore, from a clinical viewpoint, when a patient with headache is mediated primarily by peripheral mechanisms (dominantly peripheral sensitization), early and appropriate local treatments and functional activity should be encouraged. For instance, in a patient with frequent episodic tension type headache where the peripheral input is mainly dominant, a manual therapy approach including inactivation of active trigger points in the upper trapezius,⁴⁷ sternocleidomastoid (Fig. 1),⁴⁸ temporalis,⁴⁹ suboccipital (Fig. 2),⁵⁰ extra-ocular superior oblique⁵¹ or extra-ocular lateral rectus⁵² muscles (Fig. 3), cervical mobilization/manipulation (Fig. 4), and exercises targeted to the neck flexor or extensor synergy⁵³ may be appropriate. A patient with cervicogenic headache, where the peripheral input is mainly dominant, can benefit from a multimodal manual therapy management including upper cervical spine joint mobilization and/or manipulation⁵⁴ (Fig. 5), thoracic spine manipulation⁵⁵ (Fig. 6), and deep cervical flexors endurance exercises⁵⁶ (Fig. 7). Clinicians should remember that



Figure 2 Manual therapy addressing trigger points in the suboccipital musculature. The fingers of the therapist are placed in the space between the occipital bone and C1–C2 vertebrae. The metacarpophalangeal joints are flexed 90° and the interphalangeal joints are extended. This position induces a pressure over the suboccipital musculature.



Figure 3 Manual therapy addressing trigger points in the extra-ocular muscles. One hand of the therapist grasps the eye of the patient and the other one grasps the frontal bone. A manual stretching of the extra-ocular muscles is applied by moving the eye into the opposite direction.

the aim of these techniques is the restoration of the function by limiting the chance of sustained central nervous system facilitation for preventing the development of central sensitization.

In a patient with headaches that appear mediated by central processes (dominantly central sensitization), a multimodal manual therapy combined with cognitive approach should be encouraged. Depending on the chronicity of the disorder and the associated disability, patients should be educated on strategies for optimizing normal functional movements and undertaking active and specific or more global exercises. In such cases, manual therapists should consider the complex neurophysiological mechanism involved in manual therapies. In this kind of patients, the objective of the treatment should focus on two main aspects: (1) decreasing the central sensitization with interventions targeting the central nervous system (drugs and cognitive/educational aspects) and the peripheral nervous system (manual therapies); and (2) increasing the activation of descending inhibitory systems (exercise and education).^{57,58} For instance, education on pain physiology was able to increase pain thresholds and improve pain behavior and pain-free movement



Figure 4 Posterior-anterior upper cervical spine joint mobilization. The thumbs of the therapist make contact over zygapophyseal joint of C1/C2. A posterior-anterior glide of the C1/C2 joint is applied.

in individuals with chronic whiplash associated disorders.⁵⁹ A meta-analysis of 53 trials demonstrated the usefulness of relaxation and electromyography biofeedback therapies in the management of tension type headache.⁶⁰

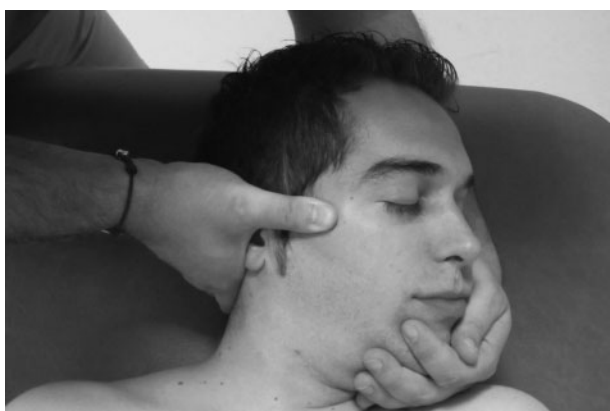


Figure 5 Upper cervical spine joint manipulation. The therapist uses the manipulative hand to localize the motion segment targeted (C1/C2) in rotation motion and uses the hand to perform a high-velocity, low-amplitude thrust into rotation, which is directed up towards the patient's contralateral eye.



Figure 6 Supine upper thoracic on mid-thoracic spine manipulation. The therapist uses the manipulative hand to stabilize the inferior vertebra of the motion segment targeted and uses the body to push down through the patient's arms, to perform a high-velocity, low-amplitude thrust.

In such a scenario, manual therapies targeted to decrease peripheral nociceptive inputs also play an important role in the management of central sensitization in these patients. For instance, since active trigger points are related to central sensitization in patients with tension type headache,⁶¹ manual therapies targeted to the appropriate musculature are also needed. It is suggested that specific muscles can be more relevant to the clinical course of tension type headache rather than the number of active trigger points itself. In line with this hypothesis, some studies have demonstrated that active trigger points in the suboccipital and temporalis muscles were related to a greater severity of headache clinical parameters.^{47,49} In addition, Ashina *et al.* demonstrated that pain sensitivity and temporal summation is higher in the neck-shoulder muscles, e.g. upper trapezius, than in others, i.e. tibialis anterior.⁶² In fact, management of muscle tissues in patients with central sensitization is supported by research suggesting that trigger point treatment induces segmental

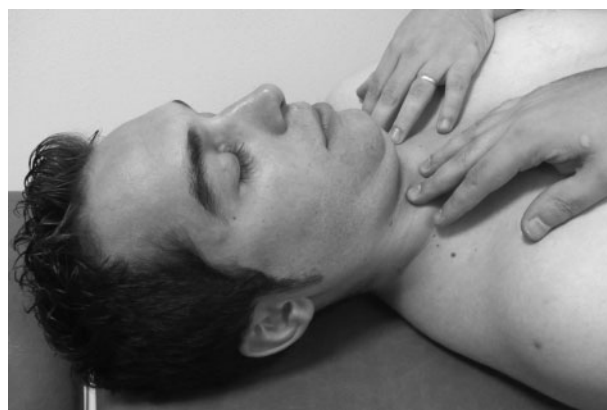


Figure 7 Deep cervical flexor exercise. The patient is asked to gently nod the head as he/she was saying 'yes' without restoring to retraction, without strictly involvement of superficial flexors, and without a quick, jerky cervical flexion movement.

anti-nociceptive effects,^{63,64} while others proposed that trigger point therapy decreased pressure hypersensitivity in distant pain-free areas suggesting a generalized anti-nociceptive effect.⁶⁵

Conclusions

Scientific evidence related to the effectiveness of manual therapies in headaches is controversial. There is also evidence supporting the presence of peripheral and central sensitization mechanisms in tension type and cervicogenic headache. Clinicians should be aware of using therapeutic strategies, based on nociceptive pain rationale, which exert a modulating effect on the central nervous system for the management of patients with chronic headache.

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