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Headache Intervention: A Nonpharmacologic Approach to the Treatment of Tension-Type Headaches

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HEADACHE INTERVENTION:
A NONPHARMACOLOGIC APPROACH TO THE TREATMENT OF
TENSION-TYPE HEADACHES

by

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Bachelor of Science in Physical Therapy
University of North Dakota, 1996

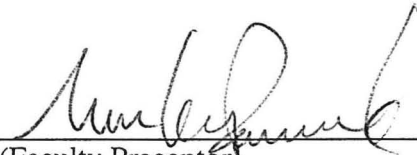
An Independent Study
Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
University of North Dakota
in partial fulfillment of the requirements
for the degree of
Master of Physical Therapy
Grand Forks, North Dakota

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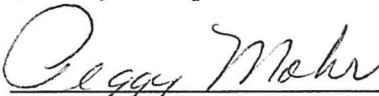
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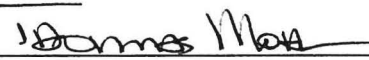
This Independent Study, submitted by Martin D. Mohr in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.



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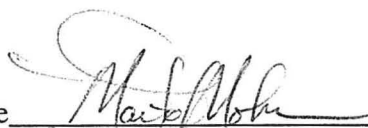
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ABSTRACT

Headaches have long been a problem for many people with hundreds of thousands seeking medical attention for their head pain each year. Migraine and tension-type are by far the most common forms of headaches, but from a physical therapy standpoint, the literature indicates that tension-type headaches respond better from the services provided by a therapist. The objective of this literature review will be to examine the different nonpharmacologic physical therapy approaches to the treatment of tension-type headaches. The techniques to be examined will include spinal manipulation, traditional physical therapy, electroacupuncture, and biofeedback and relaxation training. Examination of the literature will offer insight as to which form of treatment is most effective.

INTRODUCTION

The majority of the population will at one time or another suffer from headaches. As a matter of fact, 88% of the population will have experienced at least one headache within the next year while 38% will have one within the next two weeks.¹ It is this kind of prevalence that makes the topic of headaches so interesting. The fact that physical therapy is a major part of treatment makes it even more important. When one thinks of headaches, the most common type that comes to mind is migraine; but in fact, the most common form of headache is tension headache.² The tension headache is one described as dull, nonthrobbing, and often located on both sides of the head.^{2,7}

Headaches lead to an estimated 18 million office visits annually in the United States alone.¹ Another source reports headaches leading over 40 million Americans to seek medical help each year.⁸ Another way to appreciate the prevalence is to consider that 16% of the population suffer from some type of headache each day, which ultimately totals a very large number.⁹ Literature also shows that far more women than men suffer from headaches. Because headaches affect us in many ways and to differing severity, it is of utmost importance to find a successful treatment intervention. Unfortunate as it may be, the treatment of migraine headaches has not seen significant improvements in the literature when treated nonpharmacologically. That is why the scope of this paper will be on tension and tension-type headaches. With the exception of drug intervention, many other approaches have been examined regarding the treatment of headaches. Some of the most common noninvasive techniques include TENS, massage, exercise, manipulation, biofeedback, ultrasound, and cold/hot therapy.^{9,10}

Headaches are categorized in so many ways and there are so many theories as to the cause of headaches that an entire paper could be written on that information alone.

However, it is the intention of this paper to examine only tension and tension-type headaches and their signs and symptoms, while briefly examining some of the latest theories on the etiology and pathophysiology of these headaches. The latest classification of headaches as well as the mechanism will also be examined.

The purpose of this independent study report is to determine the most effective nonpharmacological intervention in the treatment of tension headaches that may be performed by a physical therapist. Specifically, the treatment alternatives to be examined are spinal manipulation, traditional physical therapy, electroacupuncture, and relaxation and biofeedback. It will not be in the scope of this paper to discuss the effects of pharmacological intervention, since it has been shown in literature that tension type headaches do not respond as well as migraine headaches to prescription analgesics.^{8,11,12}

OVERVIEW OF HEADACHES

Perhaps the most difficult aspect of researching this topic is that of understanding the literature on the headache itself. There are multiple ways to categorize headaches, as well as determining such causes as muscle origin, cervical origin, or vascular origin. Different authors will refer to the same headache in two or even three different ways. What may be a tension headache in one article may be a primary headache in another or a muscle contraction headache in another. What is easy to comprehend is the fact that despite all of the literature on headaches, the etiology and pathophysiology remain a mystery. One consistent point is that most authors agree on the same signs and symptoms of tension type headaches. The aim of this chapter will be to describe the prevalence of headaches in society, the characteristics and symptoms, classification, pathophysiology, and the etiology of tension headaches as best understood by experts in the field.

It is estimated that nearly 90% of all headaches fall into the category of tension-type. Approximately 15% of the population will suffer from their first headache before the age of 10.⁶ Concerning the prevalence among the sexes, nearly 75% of the headache cases are women, and they are much more likely to seek medical attention for their headaches.^{2,12} There is no genetic explanation for the higher prevalence of headaches among women, but there is strong evidence that 40% of all sufferers have a family history of headaches.²

An important aspect to examine concerning the effects of headache is that of lost productivity and work time. In a Danish study, it was found that 1090 work days per year were lost for every 1000 employees suffering from either migraine or tension-type headache. In the United States, it is estimated that patients are bedridden 3 million days per month and endure restricted activity 74 million days per year. From a financial aspect,

lost productivity accounts for nearly \$1.4 billion per year.¹² Not only is work affected but leisure time as well. In one study, authors found that headaches rarely occurred during work hours, but were prevalent during non-work time in activities such as social relations, sports, hobbies, reading, and sexual relations.⁷ Mood can also be greatly affected by headaches, often leading to depression and altered social relationships and life-style. Over one-third of the patients indicated that their headache influenced their social plans, and nearly half of them reported being worried about headaches occurring during future events or while driving.¹¹ Overall limitations to regular activities occurred with nearly 80% of migraine sufferers compared to only 38% of tension-type sufferers.¹³

The pain associated with tension-type headache is customarily bilateral, of varying intensity, and has a pressing or stabbing characteristic to it.¹¹ The pain pattern is often described as band-like around the head and has a varying duration lasting anywhere from 30 minutes to several days.^{3,4,6,14,15} The area of pain is mostly located in the occipital, frontal, retro-orbital, or suboccipital area. Some patients will describe pain behind the eyes, rising from the shoulders, or localized in the forehead.^{3,4} The frequency of tension-type headache is similar to migraine in that it is intermittent.¹⁶ Furthermore, the headache cannot be present more than 15 days per month, otherwise it is termed chronic tension headache.¹⁴ A major difference between migraine and tension headache is that nausea and vomiting are uncommon in tension headaches.¹⁵

If one could point out warning signs of tension-type headache, they would be tension and aching in the neck and suboccipital regions.⁴ The precipitation of attacks can be related to stress of some kind, awkward posture (often neck flexion), awkward sleeping position, and trauma.³⁻⁵ Literature also reflects that attacks can be due to monotonous work or masticatory dysfunction.^{16,17} In fact, symptoms of headaches can come from any dysfunction of the joints, muscles, ligaments, or other soft tissues of the neck.³ The most common symptoms of tension-type headache are muscle tenderness in the suboccipital or upper back regions, a dull band-like ache, tight scalp, and limited neck motion.^{3,4,6} One

psychological symptom that is often evident is depression.^{11,13} Other common symptoms include the inability to concentrate, visual disturbances, and phonophobia, or a sensitivity to intense sound.^{3,4,6} If the headache is a true tension-type, one will not see vascular symptoms such as nausea, vomiting or anorexia.^{6,11} In the more chronic stages of tension headache, one may see dizziness, fatigue, and lightheadedness.⁶ One key factor in the characterization of pain in tension-type headache is that physical activity does not aggravate it.^{4,12,14}

Perhaps one of the most confusing issues in the discussion of headache is the terminology or classification. What may be known as one type of headache to one author may be referred to a different name by another. What also seems to be tedious is that once a name is agreed upon, the criteria necessary to be classified as that type must then be agreed upon. It is the aim of this section to attempt to shed light on the classification and terminology of headaches. There are so many different names that it is probable that each person has heard of at least one of the following: tension, tension-type, muscle contraction, migraine, cluster, cervicogenic, primary, and secondary. Micieli et al⁷ have gone so far as to mention such types as episodic cluster, episodic tension-type, episodic, and migraine combined with tension-type headache.

One approach to understanding the classification of headache types is to classify them as primary or secondary. Primary headaches total the largest number of complaints and include such headaches as tension-type, migraine, cluster, and muscle contraction.^{8,15} These headaches are classified in this way because they have no direct cause. Secondary headaches, on the other hand, point out some identifiable structure or pathology.¹⁸ Such precipitating factors of secondary headaches include cerebrovascular lesions, meningeal irritation, intracranial pressure, and systematic or traumatic causes.⁸ It is not the purpose of this paper to discuss secondary headaches but rather primary headaches since they include tension-type headaches.

As previously mentioned, tension headache is primary because it is not due to some specific underlying cause. The mechanism is not well understood, but it is speculated that the aching of tense neck and cranial muscles may produce the common tension headache. It is also speculated that all primary headaches represent a spectrum of the same disease and that an individual suffering from headaches may have a muscular mechanism present as well as a vascular one.¹⁹

The International Classification Committee of the International Headache Society (IHS) has offered help in the area of classification. In 1988, the committee devised a widely accepted approach to better diagnose or classify headaches, especially migraines and tension-type.^{11,12,14} Much of the confusion in terminology comes from the headaches being classified according to their etiology, when it is so poorly understood in the first place.⁶ What the IHS did was to help classify headaches as mainly migraine and tension-type, as well as numerous other classifications shown in Table 1. Unfortunately, not all researchers and authors use the IHS system of classification.

In the past, tension headaches have been referred to as muscle contraction, cervicogenic, and tension-type.⁶ Cervicogenic headache refers to any kind of headache that arises from the cervical spine.⁵ It is classified by the IHS with the criteria including pain local to the neck and occiput and spreading to other areas of the head. The presentation and characterization are very similar to tension-type headache. In this paper, the term tension or tension-type refers to the above as well as chronic tension headache and chronic daily headache, which is a more severe, chronic form of tension headache.^{6,17} For clarification, the prototypic tension-type headache is characterized by pressing or tightening around the head, mild to moderate intensity, bilateral locale, and decreased cervical range of motion. It may or may not inhibit daily activity, and it is not accompanied by nausea or vomiting.^{5,12}

Stephen Silberstein, M.D.¹⁴ has further expanded the descriptions of some of the classifications of headaches according to the IHS. He notes that a tension-type headache can be unilateral and throbbing, as long as the intensity is mild and not aggravated by

Table 1. Headache Classifications

I. Migraine

- A. Migraine without aura
- B. Migraine with aura
 - 1. Typical aura
 - 2. Prolonged aura
 - 3. Acute onset aura
 - 4. Basilar
 - 5. Familial
- C. Childhood migraine
- D. Retinal migraine
- E. Migraine not fitting above classifications

II. Tension type

- A. Chronic tension type
 - 1. Involving pericranial muscles
 - 2. Not involving pericranial muscles
- B. Episodic tension type
 - 1. Involving pericranial muscles
 - 2. Not involving pericranial muscles
- C. Tension type not fitting above classifications

III. Various other classifications/causes

- A. Cluster
- B. Trauma
- C. Vascular disorder
- D. Substances or their withdrawal
- E. Associated with cranial, facial disorder
- F. Metabolic
- G. Neuralgias

Adapted from IHS Classification Committee. Edmeads J, Findlay H, Tugwell P, Phillips WP, Nelson RF, Murray TJ. Impact of migraine and tension-type headache on life-style, consulting behavior and medication use: a Canadian population survey. *Can J Neurol Sci.* 1993;20:131-137.

activity. He also states that tension-type headache is the most common headache type with a lifetime prevalence of 90% in women and 67% in men. In fact, it is very uncommon that an individual has never experienced a tension-type headache. Finally, Silberstein mentions that episodic tension-type headache has not been differentiated from chronic tension-type (CTT) or chronic daily headache (CDH). CTT was at one time called CDH, although they are not identical.¹⁴

One important classification of headaches not to be left out is that of headaches due to whiplash injury. Whiplash refers to the mechanism of hyperextension followed by neck flexion, usually as a result of a motor vehicle accident in which the injured person was struck from the rear.^{6,20} It has been shown experimentally that accelerated extension injuries can result in damage to multiple structures of the neck. These injuries include muscle tears, avulsions, hemorrhages, and rupture of ligaments. Most patients suffer from either myofascial pain or headache pain. Myofascial pain refers to local tender points in muscles with referred pain in the ipsilateral extremity. An amazing 82% of victims of whiplash complain of headaches within the first four weeks post injury. Nearly three fourths of these people continue to suffer headache pain ¹² weeks after the traumatic event. The headaches are usually a result of muscle contraction in the upper back and neck area.²⁰

The pathophysiology, the study of how a disease alters normal processes, is not well understood.²¹ However, there have been advances made that may help shed some light in understanding the process. It is now proposed that headache pain may be generated centrally according to the neurogenic theory.¹⁵ There is still controversy as to whether the pain is secondary to muscle spasm or if it is a manifestation of a central neurologic mechanism.⁶ By examining EMG findings, it was felt that most studies failed to show a relationship between pain and muscle tension, as measured by surface EMG. There was no correlation between the symptoms of tension-type headache and increased EMG activity of the frontal muscles of the head. However, in a separate study of pericranial tenderness, a correlation was found between muscle tenderness and complaints of the symptoms of

tension-type headache.^{6,20} These mixed findings would suggest that there may be both a central and peripheral mechanism involved in tension-type headache.⁶

One individual who has done extensive work in the area of pathophysiology of headache is Dr. Wolff. He has performed a considerable amount of research in the area of vascular causes and intracranial structures as related to the cause of headache.^{15,22} Wolff's vascular theory states that the aura of migraine is caused by intracerebral vasoconstriction while the pain is caused by vasodilatation of the external carotid arteries.²² Unfortunately, his theory has been doubted and fails to prove or explain several key factors. Wolff has shown that certain intracranial structures are sensitive to pain which include the great venous sinuses, 20% of the larger arteries of the Circle of Willis, pain sensitive fibers of the fifth (trigeminal) cranial nerve the ninth (glossopharyngeal) and tenth (vagus) cranial nerves, and upper cervical nerves. The structure of significant interest is the trigeminal nerve. In response to neurogenic inflammation, the trigeminal nerve is stimulated and releases substance P and other neuropeptides that ultimately lead to the perceived pain.¹⁵

Getting back to earlier studies, it was demonstrated that tension headaches result from a decrease in blood flow to the muscle. This results in subsequent ischemia which leads to metabolic changes causing pain.^{6,14,17} Whether or not the ischemia plays a major role in the pain of tension headache remains uncertain.⁶ Another concept concerning the cause of headache pain is introduced in the form of trigger points. Irritation of certain muscles in the region of the neck and upper back can cause tender nodules in the muscle. The most common muscles affected are the sternocleidomastoid, splenius capitis, temporalis, masseter and upper trapezius. This irritation can be caused by sustained muscular contraction of any of the abovementioned muscles.¹⁷

Many theories have been proposed concerning the etiology of tension headache. Unfortunately, they are only theories. Some authors want to hold on to the notion that muscle contraction causes the headache while others are more scientific in their approach, such as examining intracerebral structures as possible sources. As previously mentioned,

many thought it was ischemia from chronically contracted muscles that led to the pain and tenderness.¹⁴ Schoensee et al³ argue that the etiology of tension headache is related to articular dysfunction of the first through third cervical vertebrae and the surrounding structures. These associated structures are the annulus fibrosis of the intervertebral disks, ligaments, periosteum, cervical nerve roots, muscles and arteries.⁴ The dysfunction may arise from trauma such as whiplash, which will be discussed later. The authors believe that the C2-3 zygapophyseal joint dysfunction is the main cause of tension headache.³ It has been demonstrated that pain can be induced by noxiously stimulating such structures as the joint capsule or suboccipital muscles that are innervated by the cervical nerve roots C1-C3. It is these cervical nerve roots, combined with the trigeminal nerve, that make up the greater and lesser occipital nerves.²³ The joint capsule and other structures in the “headache area” are innervated by the greater occipital nerve.^{1,23} The pain may result from the common pathway shared by the upper cervical nerves and the trigeminal system. Because of this, cortical pain centers will interpret the headache pain arising from areas of the head innervated by the trigeminal nerve system.¹

The trigeminal nucleus caudalis is a major relay for head and neck pain. It receives inhibitory and excitatory stimuli from the pericranial muscles and cervical arteries. If stimulation is too intense, neuronal activation increases and non-painful stimuli begin to be interpreted as noxious stimuli. The end result is neurogenic inflammation with nonpainful input becoming painful stimuli. Normal myofascial input becomes painful which ultimately leads to a secondary tension headache.¹⁴

It is important to mention the temporomandibular joint (TMJ) and whiplash as possible causes of headache. The temporomandibular joint is controversial, but it has been hypothesized that joint disease in the form of disk dislocation or degenerative changes could have something to do with headaches.⁶ Many patients with TMJ problems present with pain and tenderness in the muscles associated with the joint as well as distribution into the neck and shoulders. This could be the result of bruxism, excessive clenching, or an

abnormal bite producing strain on the ligaments and muscles of the joint.^{6,24} Problems with the TMJ can also be associated with traumatic injuries sustained in a whiplash injury. The trauma could result in internal derangement or associated jaw pain from a myofascial injury. The most common source of headache pain following a whiplash injury is associated with muscle contraction. As previously mentioned, the muscle contraction causing the headache pain is associated with the greater occipital nerve.²⁰

Psychological factors, such as physical and emotional stress, are also named as causes of tension headache.^{6,16} An individual who is prone to high levels of stress is much more likely to suffer from tension headaches than someone who has little stress or anxiety in their lifestyle.² Depression and anxiety are common clinical manifestations in tension headaches, with chronic tension headache sufferers showing elevated depression scores on the Minnesota Multiphasic Personality Inventory test.⁶ Although it appears clear that the vast majority of headache sufferers demonstrate psychological stressors and symptoms, it seems that the headache is indeed due to a physical process. The presence of psychological signs has no tie to the etiology of tension headache.²

Although there is no clear etiology to tension headaches, literature provides a strong argument for the involvement of the cervical nerve roots and the trigeminal nerve system. Because of their relation to each other and the subsequent involvement of the joints, muscles, and surrounding structures in the neck and upper back, this theory offers the strongest defense in the cause of tension type headaches. The arguments of psychological factors, ischemia, trigger points, and TMJ all have significant importance, but are not enough to satisfy all of the questions. Because tension headaches are so complex and common, there is no one simple way to determine how or why they occur. It is the physical therapist's interest to determine the best approach to offer relief from the pain. It is beneficial to have the literature on the different theories and research so that the most effective and most appropriate treatment program can be implemented.

SPINAL MANIPULATION

To date, there haven't been many studies performed on the effects of spinal manipulation on cervical headaches. However, there are studies that have found it to be beneficial, but there is much more room for further studies to determine the prolonged benefits of this procedure. Upon review of several articles regarding spinal manipulation or cervical mobilization, most of the literature comes from studies performed by chiropractors and physical therapists.^{1,3,4,9} The most common approach used by chiropractors is the toggle recoil technique, which will be described later.^{4,9} As for physical therapists, passive physiologic intervertebral movements (PPIVMS) and passive accessory intervertebral movements (PAIVMS) are the more common techniques applied which will also be discussed shortly.³ These techniques will be described later.

Often times, manipulation and mobilization have been used interchangeably to describe essentially the same thing. They both refer to a type of passive movement to restore normal motion within a joint. Mobilization more often refers to the type of passive motion that is more rhythmic and is performed in varying amplitudes and at various points in the range of motion.^{1,3,4,9,25} Manipulation is the technique that uses higher amplitudes and velocities within or beyond the available ROM.³

In other studies, various authors have found results of mobilization to be quite effective. In a study performed by Vernon²⁶ results showed that headache frequency, duration, and severity all significantly decreased with manipulation. This was found this by measuring outcomes from a questionnaire patients filled out concerning the abovementioned measures of headache pain. In a separate study by Parker et al²⁷ cervical manipulation was examined as performed by three different professions. Results

showed that the manipulation received by physicians, PTs , and chiropractors in three different groups decreased frequency, duration and intensity of migraine headaches.

A clinical controlled trial performed by Jensen et al²⁸ compared manual therapy and cold pack treatment on post-traumatic headaches. The manual therapy, which consisted of mobilization and muscle energy techniques applied to upper thoracic and cervical spine, demonstrated significant improvement, whereas the cold therapy showed no significant change in pain measures.

A group of physical therapists and physicians examined the effects of mobilization on cervical headaches.¹² In their study, subjects were divided into two groups and were examined as to the effect of mobilization of the upper cervical spine and its effect on headache factors of frequency, duration and intensity. The subjects met the criteria as set forth by the International Headache Society (IHS).²⁰ Headache factors were obtained using a self report and recorded in individuals headache logs. The intensity was obtained using a visual analog scale (VAS).³ Baseline ROM values were obtained by assessing accessory and physiological movements of the intervertebral joints of occiput-C1 joint through C2-3 joint as performed by physical therapists. PPIVMS included testing flexion, extension, and lateral flexion. Limited movement was estimated on a scale of 1 to 3, 1 being normal and 3 severely limited. Accessory motion was assessed according to the techniques described by Maitland, measured on the same scale of 1 to 3. Posterior-anterior glides were performed centrally over spinous processes of C2 and C3 and unilaterally over C1 through C3.

Results of a study by Schoensee et al³ demonstrated improvements in all three headache factors when the mobilization was administered. Although duration and intensity improvements did not last through withdrawal of treatment, they were lower than baseline values. It was postulated that the C2-3 joint was a cause of pain due to the innervation from the C3 dorsal rami. The C2-3 joint is the only upper cervical joint where the nerve innervating the joint crosses directly over the articular surface. Thus, it is possible that

mobilization can restore normal mobility and decrease the firing of the pain receptors in the joint under stress. The authors also found C2-3 to be the most common area of stiffness, tenderness, and dysfunction in the cervical spine. Subjects in this study who came under stress exhibited increased muscle activity, thus presenting with hypersensitive myofascial trigger points. The primary muscles involved were those used to maintain correct posture of the neck.

Conclusions of this study revealed that mobilization was successful in decreasing headache frequency, duration, and intensity. However, the authors stated that further studies are needed to examine the possibility of other treatments playing a role in the findings. Treatments employed by therapists such as postural training, and shoulder and neck exercises may have enhanced the gains of the mobilization.

Two separate studies examining the effect of manipulation in the treatment of cervicogenic headache use a technique referred to as the toggle recoil method.^{4,9} This technique is most commonly employed by chiropractors. It was developed by B.J. Palmer in the 1920's and incorporates a high velocity, low amplitude thrust to the lateral side of C1. The patient is placed in a lateral recumbent (sidelying) position with the head placed on a drop piece headpiece. The neck is maintained in neutral position throughout the treatment.⁴ The thrust is applied at the end of available ROM and is often accompanied by an audible crack.⁹

The toggle recoil technique was found to be beneficial, although there were limitations in both studies.^{4,9} Whittingham et al⁴ was limited by a small sample size and nonrandom bias. In his study, it was confirmed that 76% of the subjects had a decrease in headache duration of more than 50%. Total relief was experienced by 15% of the subjects. One interesting note was that none of the participants suffered exacerbations or adverse effects from the manipulation. And in many cases, those with the most severe headaches benefited the most.

Niels Nilsson⁹ performed a randomized controlled trial using manipulation on 39 subjects meeting the IHS criteria listed in the publication of this article. All subjects participated in the six week study which consisted of both treatment and filling out headache diaries.

The group not receiving the toggle recoil instead received laser and soft tissue treatment. Soft tissue referred to deep friction massage of the trigger points and posterior muscles of the shoulder girdle along with the upper thoracic and lower cervical muscles. No therapeutic effect was expected to be obtained from the laser.⁹

Results of Nilsson's trial showed a statistically significant reduction in the number of headaches per day for the soft tissue group. In the manipulation group, headache intensity, number of headaches per day, and analgesic consumption all improved. However, there was no significant difference between the two groups, thus implying they were quite comparable. In conclusion, the author found that this trial may demonstrate more of a placebo effect than other hands-on interventions. Even though the manipulation group fared better than the soft tissue group, it is not feasible to say that one treatment was better than the other in this scenario.⁹

The final discussion of spinal manipulation in the treatment of cervicogenic headaches refers to a study performed by Bolin et al.¹ The objective of their study was to compare the effectiveness of manipulation versus a pharmacological intervention with the use of amitriptyline in the treatment of chronic tension-type headache.

A total of 150 patients were randomly placed into either the manipulation or amitriptyline treatment group. Subjects in the amitriptyline group received the drug daily for 6 weeks. Subjects in the manipulation group received treatment twice per week for 6 weeks. They received a short lever, low amplitude, high velocity thrust to the appropriate segment of either the cervical, thoracic or lumbar spine, as determined by the physician in charge. Prior to manipulation, all subjects received moist heat and light massage to the cervical and thoracic musculature.¹

Four main objectives or outcomes were measured which included headache intensity, frequency, over the counter medication use, and the impact on their functional health status. There was no significant difference between the two groups at the end of the 6 weeks. However, upon termination of treatment, the manipulation group did show improvements in all outcomes while the amitriptyline group showed no improvement and even slight worsening in some cases.

A promising finding related to the articles examining manipulation was the fact that the manipulation group in Boline's study¹ demonstrated improvements in the outcomes four weeks after treatment. Although the headaches had not totally dissipated, they were measured lower than their original baseline scores. Most authors went on to state that spinal manipulation was far superior to both no treatment and mobilization after three weeks than no treatment at all. Also promising was the fact that many subjects in this study were able to decrease their consumption of nonprescription medications.¹

In summary of the studies on spinal manipulation, it was found that manipulation did have a therapeutic effect on tension-type headaches.^{1,3,4,9} It is theorized that manipulation works because it restores the normal mobility in the joints of the cervical spine, specifically that of C2-3. The upper cervical joints produce noxious stimulation via the nerve roots crossing the articular surface of these limited segments.^{1,3} Headache pain perceived is felt to be the result of cortical pain centers interpreting the stimulation from the structures in these areas that are innervated by the trigeminal nerve system. That is why it is possible that manipulation is effective, as it reduces transmission of the noxious stimulus.¹ Although most of the studies stated that further studies need to be performed, it is promising to find that spinal manipulation is an effective treatment in the approach to tension headaches.^{1,3,4,9} The only major question mark remains in the long term effects of manipulation.

TRADITIONAL PHYSICAL THERAPY

A not so obvious but more common approach to the treatment of tension headache is traditional physical therapy. Physical therapy aims at relaxing the muscles that are tight and strengthening them in order to help decrease their contribution to tension headaches.²⁵ In fact, many authors have found that it is this tension and tightness of the pericranial muscles that often leads to tension headaches.¹⁶ The majority of headache sufferers often have tenderness of the pericranial muscles.¹⁷ The pericranial muscles include suboccipital, lower cervical and upper thoracic muscles, including the trapezius. The articles used in this chapter generally employed massage and therapeutic exercises as “physiotherapy” which is simply the expression for physical therapy commonly used in Canada, Great Britain, and Australia. The two terms will be used interchangeably in the throughout the course of this chapter and paper.

Several authors mention trigger points and their association with tension headaches. In many cases, myofascial trigger points are also included in the treatment regimen.^{16,17,29} The purpose of this chapter is to examine the effects of physical therapy or massage on persons with tension headache, and determine its efficacy on headache frequency, duration, and intensity.^{5,16,17,25,29}

One article from Puustjarvi et al²⁹ examines the effects of massage in patients with chronic tension headaches. In their study, they utilize 21 female subjects, all of whom are suffering from symptoms associated with tension headache. This study recorded, both before and after the 10 sessions of treatment, cervical range of motion using a goniometer, muscle tension of the frontalis and trapezius muscles using a surface EMG, and subjective information utilizing a visual analog scale (VAS) and the Finnish Pain Questionnaire (FPQ).

Results of this study demonstrated an increase in overall cervical range of motion, especially in rotation. Surface EMG revealed no significant difference in tension of the trapezius muscle, but it did reveal a significant decrease in tension of the frontalis muscle. The pain scale scores from the FPQ also decreased significantly, correlating well with the VAS scores. As far as follow-up values were concerned, benefit was still gained two weeks following treatment, but the values slowly rose over the period of three to six months.

The conclusions that can be drawn from this study are that massage is indeed beneficial in the treatment of tension headache. It not only helped decrease the pain intensity but also decreased the short term frequency and range of motion as well. The authors conclude that a rigorous program of 10 sessions over a period of 20 days whereby the subject receives soft tissue massage does have long term effects lasting up to six months.²⁹

A different approach to tension headache has been examined using active versus passive physiotherapy. It is stated that the most common treatment for cervicobrachial problems is passive physiotherapy (PP), which consists of massage, stretching, and heat. It is only recently that active physiotherapy (AP) is becoming more common.²⁵ Active physiotherapy, which includes muscle training at least three times per week, aims at relieving not only the symptoms but the cause as well by increasing strength and endurance and improving stress tolerance of the muscle.^{5,25}

A total of 47 subjects participated in a study to decide whether or not there was a significant difference between AP and PP in the treatment of cervicobrachial disorders, and whether or not pain relief lasted longer in one of the groups.²⁵ The PP group received treatment three times per week for five weeks consisting of surface heat followed by massage and stretching to the muscles of the upper shoulders and neck for a total of 60 minutes. The subjects received no home exercise program. The AP group underwent a different regimen during the same five weeks with treatment frequency of three times per

week for 60 minutes each. Their treatment consisted of stretching and muscle training of the shoulders and neck. No subject received heat or massage. A detailed description of the exercises is included in the publication of this study.

As discussed earlier, trigger points were a focus in this study as well. The popular sites in this study were the points of the trapezius and levator scapulae muscles. Both trigger points and muscle tone were evaluated in both groups before the study. Results indicate that both groups had decreased values for tone and tender trigger points following treatment and that there was no significant difference between PP and AP.²⁵

Symptoms arising from the neck and shoulders was much lower in the AP group than the PP group. Interestingly, the incidence of headache was far lower in the AP group than the PP group after a 12 month follow-up. The authors concluded that immediate results were better in the AP group, but both groups had positive effects on tension headache. Unfortunately, the effects were short lasting in the PP group.

Another notable piece of literature was a single case study examining the effects of physiotherapy in the management of cervicogenic headache.⁵ A single case study was chosen because it is effective for a more in-depth investigation of treatment for an individual. Use of the single case study is not intended to be generalized to the population as a whole. The subject met the criteria established by the IHS and treatment was carried out in three 6 week phases. The treatment utilized in this study consisted of baseline data collection, manipulative physiotherapy, and implementation of a home exercise program. The baseline data included information ranging from headache history to ROM, strength, and posture. During this phase of the study the subject received no therapy. The manipulative phase focused on the manipulation of joints of C1-2 and C2-3, as well as on muscle re-education, posture training, and muscle lengthening. Finally, the third phase discontinued active intervention and implemented home exercise. These home program included muscle lengthening of the upper traps and scalenes and deep neck flexor endurance exercises to be performed once per day.

Examination of these results revealed beneficial information. The subject in this study described two different types of headache, unilateral and bilateral. There was significant reduction of the unilateral headaches throughout the study while the bilateral remained unchanged. The significance of this is that it indicates there was no placebo effect because it was ruled that the bilateral headaches were not cervicogenic or cervical in origin, while the unilateral headaches were of cervical origin. This conclusion can be made because of the reduction of headache following articular and muscular treatment.⁵

Upon further review of the study muscle tone of the upper trapezius and scalene muscles was high in the beginning but essentially normal by the end of treatment. The most symptomatic cervical intervertebral joint was the left C1-2 and was relatively hypomobile, as well as C2-3 (bilaterally). By the end of the study, normal movement was restored in all joints in the cervical region. Concerning the headache type, it was found that precipitators of the unilateral headache included certain neck postures and carrying loads. The bilateral headaches could be attributed to factors such as viral infections and stress. As previously mentioned, common tension-type headaches are unilateral, indicating this treatment benefited this type of headache the subject was suffering from. The final conclusion drawn from this single case study is that cervicogenic headaches respond very well to manipulative physiotherapy followed with a comprehensive home exercise program.⁵ To reiterate a point made earlier, this study is not intended to be generalized to the population, thus providing a major shortcoming of this article.

Jane Carlsson et al^{16,17} have done much work in the field of tension headaches, determining which treatment alternatives provide the best results. In the articles described, physiotherapy and acupuncture are compared, although only the physiotherapy results will be discussed now. In two separate studies with various authors, Carlsson recruited 62 females with chronic tension headaches and divided them into two treatment groups, physiotherapy and acupuncture. The major difference in the two separate studies is that one more closely examines muscle tenderness while the other focuses more on overall

health status. The authors offer valuable insight to some possible causative factors of tension headaches, including both somatic and psychological factors. Factors include such triggers as faulty posture, masticatory dysfunction, monotonous work positions in which a person sustains unnecessary muscle contractions of the upper shoulders and neck musculature, and even increased anxiety, stress or noise. One note made by the authors is that many people respond to tension headaches by increasing intake of analgesics, which may actually increase the pain.¹⁷ The methods of the first study examined headache intensity, cervical mobility and muscle tenderness.¹⁶ A scale of zero to three was used to describe tenderness.¹⁷ Zero indicated no pain, one indicated tenderness but no visible reaction, two was tenderness and reaction, and three was severe pain and a “jump sign”. The jump sign is an expression used to describe the patient's response to pain caused by the palpation where the patient visibly moves. Methods for the second study looked at functional status as measured by the Sickness Impact Profile (SIP) as well as headache frequency, intensity, and emotional state and well-being. Well-being was measured with the Mood Adjective Check List (MACL).¹⁶

The treatment protocol for both studies was identical. The physiotherapy groups' treatment consisted of 10 sessions which extended over 2-3 months with one to two sessions per week. The first session took a detailed history, the second session was a physical examination, and the third consisted of massage, cryotherapy, and TENS (all to be used at home as well.) The fourth and fifth sessions involved relaxation training of the entire body while the remaining session focused on noticing warning signs and further relaxation. In taking a close examination of the results of only the physiotherapy and not the acupuncture (which will come later), it becomes quite evident that the subjects greatly benefited from the treatment.^{16,17}

Patients treated with physical therapy showed a decrease in tension headache intensity and muscle tenderness but experienced no effect on spinal mobility.¹⁷ In the other study examining more of the overall health status, it was discovered that these subjects also had a

decrease in headache intensity and frequency. Physical therapy also showed to help as far as improving function according to the SIP and MACL tests. In a long term follow-up, headache intensity improvements were still seen 7-12 months later, dismissing any placebo effect.¹⁶

In short summary of the clinical effects of traditional physical therapy on cervicogenic and tension headache, it becomes clear that there is marked improvement in intensity, frequency, functional status, analgesic intake, and even muscle tenderness and tightness. It is of importance to note that more research needs to be performed, and not all results found can be generalized to the entire population. The use of a therapy program that consists of massage, stretching, muscle strengthening, a home exercise program, or any combination of these will have far superior effects than no treatment at all.

ELECTROACUPUNCTURE

The use of acupuncture for the treatment of body ailments has existed for many centuries in the Far East. Only since the 1970's has it received much attention in the United States.²¹ The concept of acupuncture itself brings mixed reactions among the medical experts, but it is difficult to disregard it as a possible treatment for ailments. Acupuncture has been used to treat of complaints ranging from simple pain to systemic conditions. Some examples of this type of pain include muscular, visceral, joint, and head. Many health care providers remain skeptical of acupuncture, but in a conversation with R. Pedrick in September 1995 he stated that he found it to be of great benefit and success within his physical therapy practice.

Acupuncture relies on the stimulation of pressure or motor points located throughout the body. In traditional Chinese texts, these points are referred to as classical acupuncture points.³⁰ There are hundreds of points located throughout the body that have been discovered that relate to different areas of the body. For example, for complaint of arm pain, one may find points in the immediate pain area as well as other points located in areas such as the feet or trunk. Classical Chinese acupuncture incorporates the use of needles inserted into the skin to an average depth of anywhere from 2mm to 3cm.^{21,30,31} Some of the more common sites of trigger points in the treatment of headache pain are GB 4, GB 5, GB 20, GB 21, and LI 4. LI 4 is most commonly referred to as the Hegu or Hoku point which is located on the interosseous muscle between the first and second fingers in the web space.^{16,17,31,32} Figure 1 displays common sites for stimulation, including over the trapezius, cervical spine, and along the nuchal line of the skull.

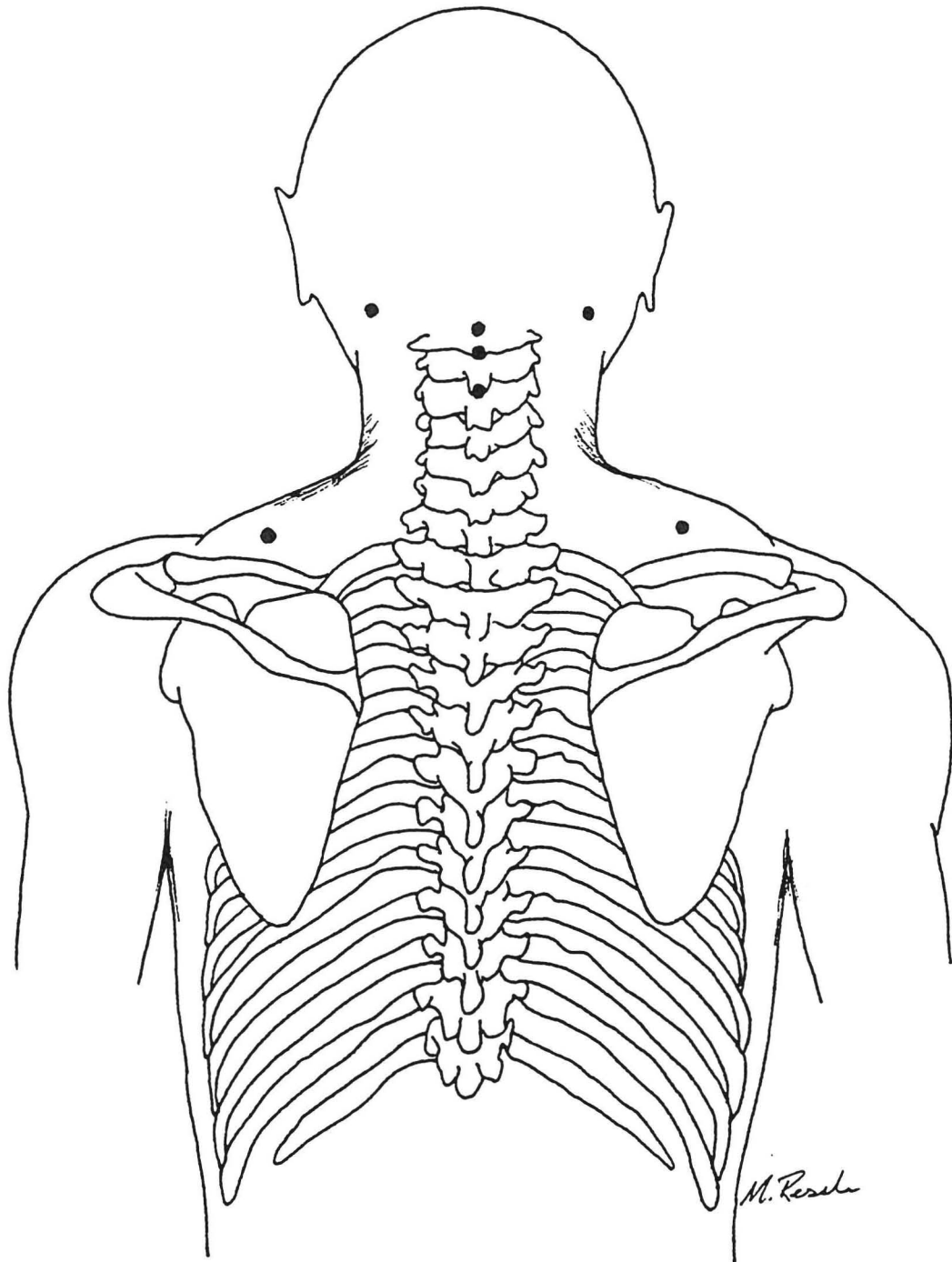


Figure 1. Common stimulation sites

Recently, the use of electrical stimulation in the form of transcutaneous nerve stimulation has been introduced in combination with acupuncture, leading to electroacupuncture.^{32,33} Stimulation is applied through a small diameter metal probe, usually less than 5mm. The electricity is usually a low voltage pulsed or direct current, with the pulsed currents ranging from 1 to 99 pulses per second.³² One study³⁴ set the electric stimulation at 140 waves per minute, while another³² was treated with 2 to 10 Hz and pulse widths of 5 to 20 ms. Treatment of individual acupuncture points typically averages 30 seconds.³³ Intensity is increased according to patient tolerance. Some of the more common devices on the market are the Neuroprobe and the Acuhealth electrical stimulators.^{32,33} Other acupuncture point stimulation devices use subliminal stimulation through the use of either a probe or pad electrodes. This is commonly referred to as microcurrent. Some clinicians believe wholeheartedly in the use of microcurrent in the treatment of pain, however, to date, there is no literature that supports the use of subliminal stimulation to relieve pain.³²

The electroacupuncture device is used in a very similar pattern as classical acupuncture. The probe electrode is applied to the acupuncture or motor point and the electrical stimulus is applied. There is usually an accompanying noxious stimulus or sense of heaviness or soreness as well as local paresthesia at the point of stimulation.^{32,34} Objective measurements can be obtained using a visual analog scale (VAS) while algometry, a technique for measuring the degree of sensitivity to pain, is used for pain quantification.³³

As mentioned previously, the combination of electrical stimulation or TENS with acupuncture can be used to treat a wide array of problems. Paris et al³⁵ used electrical stimulation of both auricular (ear) and ankle acupuncture points to treat patients with ankle sprains. Their results indicated that ankle ROM significantly improved and rehabilitation time was decreased in comparison to traditional physical therapy consisting of cryotherapy, compression and elevation. However, this treatment produced no significant differences in

amount of edema or pain reduction. Another popular use of electroacupuncture is in the treatment of incontinence.^{36,37}

There have been claims in the past that acupuncture is an effective means of treatment of tension headache. As a matter of fact, Ahonen et al³⁸ found that acupuncture treatments were as effective as physiotherapy treatments in one-half the number of visits. A separate study showed improvements in tension headaches following acupuncture.³⁹

The exact mechanism of acupuncture on headaches is unknown, but there are some theories. For the most part, the role of endorphins and other opioid peptides has been ruled out. In general, opioid peptides should be able to provide only short term analgesia, but they must be ruled out due to long term benefits experienced by some patients. It is suggested that the possible mechanism may include reflex relaxation of muscles caused by the intense stimulation of the trigger points.³⁰

Because acupuncture and electroacupuncture are so similar, studies incorporating either traditional acupuncture or electroacupuncture will be included in discussion of treatment of tension-type headache. Information and studies available in the area of electroacupuncture alone are limited. For some reason, the majority of studies performed examine the comparison of acupuncture and physiotherapy. This chapter will focus first on electroacupuncture only and then on other studies examining acupuncture and acupuncture versus physiotherapy.

In a study by Airaksinen and Pontinen,³³ the effects of electrical stimulation on myofascial trigger points using the Acuhealth pocket stimulator were examined by using pain threshold algometry. The patients in this study were all females suffering from chronic tension headache. The most common trigger points used were from the muscles of the trapezius, infraspinatus, levator scapulae, and extensor carpi group. In all, over 76 different trigger points were used. Treatment consisted of trigger point stimulation with a probe for 30 seconds in a seated position with no total number of points given. The patient received two treatments one week apart.

Results of this study suggest that electroacupuncture may be beneficial and improve pain threshold, which increased immediately following treatment. The positive effects were seen only on the stimulated trigger points and not on associated points that were left untreated. Unfortunately, this study had a small synopsis and did not go into detail on the results found or the exact treatment protocol. This could possibly be due to the fact that the authors are foreign and that the translation was inadequate. However, the study does provide positive results in the use of electrical stimulation in the treatment of tension headaches.

In a study spanning from 1987-1992, a total of 202 patients participated in a study examining headaches treated with electroacupuncture.³⁴ As in the previous study, the patients received the treatment in the seated position or in supine. A stainless steel needle was inserted into the acupuncture point at a 15 degree angle. The needle was then attached to the Model G6805 Electroacupuncture Set to deliver the low volt stimulation. The acupuncture points used were not always constant but did include the common areas previously listed.

The treatment was divided into two courses which consisted of 15 days each and was carried out daily for 30 minutes each session. Effectiveness was evaluated at the end of the second course of treatment. Patients were divided into groups according to their observed symptoms. Complete effectiveness or no remaining symptoms was referred to as “clinical cure” while “ineffective” referred to those patients who saw no benefit or change in their headache symptoms. Two other categories in between these were “markedly effective” and “improved” which meant that patients saw either total relief or some relief of symptoms, respectively.

Results of this study demonstrated clinical cure of 88 of the 202 patients with only two to 20 days of treatment. Forty-eight patients reported markedly effective and 60 cases were improved. Only six cases were found to be ineffective. This put the total effective rate of electroacupuncture for headache at 97%. In their article, the authors provided an example

case in which the female patient was cured of the headache, dizziness, and associated vomiting after only 10 sessions. Of perhaps greater importance, she reported no relapse over the next six months. The authors also found through this study that multiple stimulation of four points at one time enhanced the curative effects. They also noted that the higher the intensity the patient could tolerate, the higher the correlation to curative effects. As previously mentioned, they too wanted their patients to feel a sense of heaviness, distention or soreness at the needle site.

Vincent³⁰ wanted to assess effectiveness of acupuncture on tension headache. He incorporated 14 patients to participate in eight weeks of treatment that consisted of four treatments of acupuncture and four treatments of a control, or sham. Eight standard classical points were used in the treatment including Liv 3 and Taiyang (on the temple) which were used on nearly every patient during every treatment. During the control or sham treatment, nonclassical points were used and depth of penetration with the needle was only 2mm. Results of this study indicate a significant reduction in pain and medication intake. Of the fourteen patients involved, nine of them stated decreased head pain of more than 50%. At a four month follow up, there was still 42% pain reduction as compared to baseline results. This would have been higher but one patient experienced a complete relapse. Also at this follow up time, patients demonstrated a 74% reduction in pain medication intake as compared to baseline values.

It was argued in this study that the changes in patients were indeed caused by the treatment and not by general expectations. The author also suggests that acupuncture plays a part in the prophylactic treatment of tension headache and it could be just as beneficial as relaxation and biofeedback.³⁰

The next several studies discussed examine both the effects of acupuncture and physical therapy on the treatment of tension headache. In the first article, the authors look at oculomotor disturbances as well as head pain and any improvement due to acupuncture or physiotherapy. Various oculomotor tests were carried out to observe baseline values

and present levels of involvement. Patients in the acupuncture group received trial treatment for two to four weeks, consisting of four or five sessions, and if benefit was seen, they received four to five more. Needles were inserted 10 to 30mm deep and in some cases, electrical stimulation was applied. Each session lasted for at least 20 minutes. In the physical therapy group, for the most part, the patients were educated on factors causing their headaches and on what they could do to help alleviate their symptoms. Their treatment consisted of relaxation techniques, automassage, cryotherapy, and TENS managed by the patient. Their treatment covered two to three months with one or two 30 to 45 minute treatment each week.³¹

Results of this study showed that smooth pursuit eye movements, following an object with the eyes and not the head, improved in both treatment groups. Concerning headache intensity, muscle tenderness, and dizziness, acupuncture was able to significantly reduce intensity only when physical therapy significantly reduced all three measurements. In the discussion, the authors state that oculomotor disturbances associated with tension headaches are decreased in both the physiotherapy and acupuncture treatments. The exact mechanisms for this are unclear. Their hypothesis is that improved oculomotor function starts with reduction of pain, induced by either treatment. By decreasing pain signals, the tender muscles can relax and instead send more normal proprioceptive input. The authors provide information demonstrating that acupuncture is helpful in decreasing oculomotor disturbances but not as effective in reducing headache intensity and muscle tenderness. It would appear that physical therapy outperformed acupuncture in this setting.

Two very similar studies examined the effects of acupuncture versus physical therapy in treatment of tension headaches.^{16,17} In both cases, the acupuncture groups received treatment for a trial period of two to four weeks, comprised of four or five sessions throughout that time. Each session lasted for a minimum of 20 minutes. In both groups, if success was observed during the trial period, then an additional four or five sessions were given. Throughout all treatment sessions, the electrical parameters ranged from a

frequency of one to two Hz and a pulse width of 0.5 msec. The intensity was adjusted to patient comfort, but ranged from four to seven volts. Finally, the patients were asked to discontinue analgesic use.

Results of these studies were essentially the same. The headache did subside somewhat but the change in intensity was not significant when compared to physical therapy treatment. Concerning muscle tenderness, there was a high correlation between the intensity of the headache and muscle tenderness. Some of the muscles did exhibit decreased tenderness following acupuncture, but all muscles tested prior to treatment showed reduced tenderness after physiotherapy treatment. Intake of analgesics was not affected at all by acupuncture while it was significantly reduced following physical therapy. Carlsson et al¹⁶ did demonstrate evidence that the frequency of the headaches did decrease in both the acupuncture and physiotherapy groups. In addition, social and functional measurements were not affected by acupuncture but were improved significantly in the other treatment group.

In conclusion of these studies, it was discovered there was reduction of headache following acupuncture.^{16,17} Unfortunately for the proponents of acupuncture, physical therapy far outperformed acupuncture in many aspects. Perhaps the reason why physical therapy was so much more effective is due to the fact that it aimed to change the illness or problem rather than just treating the symptom of pain. Physical therapy also provided education for the patient in how to treat themselves and how to become aware of factors that may trigger the headache. Acupuncture simply masks the pain for a short period of time and, on the average, had no long term benefits, whereas physical therapy commonly saw improvements for at least 7 to 12 months following treatment.¹⁶ It is not the intention of this paper to dispel the positive effects of acupuncture. It can be used with a high degree of success for the treatment of tension headache but does not address the causative factors.¹⁷

In brief conclusion of this chapter, it can be assessed that acupuncture and electroacupuncture are quite effective in the treatment of tension headaches. When compared to physical therapy, it is not as successful, especially long term but nonetheless is beneficial. Ultimately, it will be the therapist's decision as to what works best.

BIOFEEDBACK & RELAXATION TRAINING

In the past, biofeedback has been used extensively in the medical field for intervention of dysfunction. It has been used to help control body temperature, blood pressure, heart rate, and muscle dysfunction.²¹ It is the latter that is most important to the scope of this paper. Biofeedback (BFB) can be used to either increase or decrease the amount of muscle contraction. The feedback is provided by a monitoring device that gives either a visual or auditory signal that provides the patient with information about the amount of tension in the muscle, enabling them to learn to suppress muscle action.³²

Upon reviewing the literature, it becomes evident that BFB is frequently combined with electromyography (EMG). Thus, the most common form of biofeedback intervention is in the form of electromyographic biofeedback (EMGBF). Electromyographic biofeedback is preferred due to its increased sensitivity and ability to provide more immediate feedback to the patient concerning efforts of relaxation or tension. The muscle activity can be more closely monitored and the patient can better learn to relax or stimulate a muscle. With concern to this paper, it is obvious that the patient response to muscle activity associated with tension headache is that of relaxation. The therapist is looking to elicit a response by the patient to relax an overactive muscle. The most common muscle used in EMGBF for electrode placement is the frontalis.^{40,41} Other muscles that have been utilized for this treatment include the trapezius, paraspinals, and temporalis.⁴⁰

BFB is a behavioral technique or therapy that is effective in allowing the patient to learn to control responses in their body.⁴² This form of behavioral therapy is commonly used to help treat both migraine and tension headaches.⁴³ Migraine headaches respond well to thermal biofeedback while EMGBF is the most common treatment for tension headache.^{42,43} The theory behind this is muscle tension causes the pain and EMGBF aims

at decreasing muscle activity. Also to be discussed in this chapter is muscle relaxation or progressive muscle relaxation (PMR). Studies comparing BFB and relaxation have found similar efficacy in reducing headache.⁴

It has been shown in literature that EMGBF is the best type of behavioral therapy for tension type headache.⁴³ Electromyographic biofeedback has also been shown to help reduce overall total pain for up to 12 months following treatment.⁴² However, the reduction was not significant, and in this case, the improved results are likely due to the learned ability to relax, rather than the EMGBF itself. In general, literature does indicate that EMGBF and relaxation therapy, either separately or combined, are superior to no treatment or placebo therapy.⁴⁵ This chapter will examine how biofeedback and muscle relaxation are applied to a patient, as well as discuss available literature regarding the efficacy of each technique.

Biofeedback aims at measuring muscle tension, generally from the forehead or upper back and neck, and then “feeding back” the information to the patient to develop a scheme to lower the amount of tension in the muscle. Although there is no one correct treatment protocol for delivering EMGBF, one procedure is documented by Arena et al⁴⁰ in a study examining efficacy of EMGBF. The treatment contains 12 sessions covering a period of six to nine weeks with an emphasis for the patient to be seen twice per week. The location of the EMG is dependent on group assignment of the patient in relation to their study. In this case, it was either the frontalis or the trapezius. Each session lasts about 50 minutes to an hour and covers a specific sequence. The first 15 minutes include collecting headache diary information, inquiring about home practice, and connecting the sensors. Next, a baseline is recorded and then the patient attempts to decrease tension independently without feedback. Feedback training last for 15 to 20 minutes followed by another self control phase which lasts four minutes. A thorough description of electrode placement can be found in the publication of this study.

During treatment, the therapist acts as a coach, providing information and encouragement, helping the patient discover a useful technique that works the best. Furthermore, the patient was encouraged to let the response of BFB happen, rather than trying to make it happen. The therapist stresses the importance of practicing the BFB exercises daily and their importance in everyday life. Further description of the procedures can be found in other publications by these authors.⁴⁶ Finally, the results of this study suggest EMGBF with electrode placement on the trapezius is more effective for tension headache than either relaxation therapy or EMGBF using the frontalis. All subjects receiving trapezius EMGBF demonstrated pain reduction of at least 50% compared to only half of the subjects in the other two groups.⁴⁰

A separate study using EMGBF looked at the effects on tension headache in children.⁴⁷ The procedure for this study consisted of measuring the Pain Total Index (PTI) to help quantify results obtained throughout the study. The PTI measures the hours the patient suffers from pain and also measures the intensity on a scale of 0 to 4, with 4 being very intense. The BFB treatment consisted of monitoring the muscle activity of the frontalis and providing appropriate feedback and instructions in an attempt to decrease the tension levels. The BFB device provided both a visual and auditory feedback signal. Treatment was comprised of 12 sessions twice per week. Actual treatment lasted 30 minutes. The first 10 minutes were used to obtain baseline data, the next 10 minutes for auditory feedback, and the last 10 minutes for baseline again. The first part of treatment established a threshold value for the auditory signal to be used in the second part of treatment. The patient then attempted to stay under the threshold value without feedback for the last ten minutes of treatment, i.e. stay relaxed. The objective of the treatment is for the patient to phase out the auditory signal all together, meaning they are relaxed to the point where the EMG produces no strong signals of muscle activity. A second important aspect of treatment was home practice. The children were instructed to practice daily for 15 minutes in order to help reduce muscle tension.

Results showed dramatically decreased PTI values from baseline to the end of treatment. Also, EMG values measuring muscle tension also decreased for every patient. This decrease in tension was accomplished in the first phase of treatment, which confirms that the relaxation response is easier to elicit in children than adults, probably due to the decreased skepticism of children. The purpose for a pediatric study such as this is to avoid a trend where children develop a need for analgesics to control childhood headache, and subsequently develop side effects from these drugs. The authors felt that EMGBF is the best treatment of tension headache in children.

The next portion of this chapter will focus on relaxation therapy and its efficacy in treatment of tension headaches. Muscle relaxation refers to the same thing as progressive muscle relaxation therapy as well as relaxation training. In this section, the terms may be used interchangeably, but in fact refer to the same method for treatment of tension headache. There are typically two important components in relaxation training. One is proper implementation of the procedure by the therapist and the other is for the subject to follow commands of the therapist.⁴⁹ If these are not followed, optimal treatment will not be achieved.

As stated earlier for BFB, there is no one muscle relaxation protocol for treatment of tension headaches. This chapter will offer several different approaches. This first approach is offered in the study by Arena et al.⁴⁰ Treatment consists of seven sessions over eight weeks. The first few sessions focus on contracting and relaxing 14 different muscle groups in order to become familiar with the feeling of each state the muscle is in. The later sessions decrease the number of muscles groups and the patient is taught different techniques for relaxing and coping. Two such techniques are relaxation by recall and cue controlled relaxation. The cue technique uses a word like “relax” or “calm” to achieve relaxation while recall requires the patient to remember what it feels like to release a muscle from a contracted state. Also included in the treatment program is relaxing imagery and muscle discrimination, in which the patient is instructed in how to differentiate between

different levels of tension. Finally, the patient is encouraged to practice relaxation at least two times per day at home. To help with this, they receive an audio tape with modified instructions.

A second approach is offered by Blanchard et al⁴⁹ in their study examining abbreviated progressive muscle relaxation and relaxation combined with cognitive therapy for the treatment of tension headache. Treatment here consists of ten sessions, two times per week for a period of three weeks and then once per week over the next four weeks. Similar to the other studies, the patient is seated in a recliner for treatment.^{48,49} These authors incorporate 16 muscle groups rather than the 14 used previously and also concentrate on diaphragmatic breathing, relaxing imagery and muscle discrimination. With treatment progression, the number of muscle groups is decreased to eight and then four. Near the end of the entire treatment, usually sessions eight and nine, relaxation by recall and cue-controlled relaxation are added, respectively. The overall goal of this treatment regimen is to gain the ability to relax promptly and regularly as well as to use these techniques to deal with daily stressors. Similar to the previous study, patients are encouraged to practice daily, twice if possible, for at least 20 minutes. Again, they receive an audio tape to guide home practice.

Blanchard et al⁴⁹ also include relaxation combined with cognitive therapy to treat tension headaches, but it is not the interest of this paper to discuss such approaches. The results of the progressive muscle relaxation showed it to be superior in reducing headaches when compared to either placebo or headache monitoring. The authors do show reservation concerning their findings and its significance.

Results of the study performed by Arena et al⁴⁰ suggest that progressive muscle relaxation is effective in decreasing total pain index in about 38% of the subjects tested. Even here it is not evident whether the frequency, intensity, or duration are affected or even improved. Unfortunately, their results discussed more of the effects of EMGBF than relaxation, since the authors indicate the former is superior to the latter.

Finally, a third technique is offered by Gutkin et al.⁴⁸ One aspect of their study that differs from the others is that more attention was given to home practice. Measures further described in the published article were taken to record the amount of time spent at home doing the exercises as well as monitoring contract and relax phases of treatment. Overall, the treatment sessions were quite similar to the others with treatment lasting only five weeks. The authors did cite Bernstein and Borkovec's procedure⁵⁰ from 1973, with adaptations made in their own study. A follow up was performed one year later asking the subjects to fill out a headache diary. The published copy of this study did not go into much detail concerning the procedure.

Results of this study show different findings when compared to the previous two. Headache intensity did decrease from baseline through maintenance, or no treatment. In fact, the number of headache free days per week increased for each subject. The authors mention in their discussion that literature indicates that anywhere from 60% to 70% of all patients receiving relaxation training for tension headache improve their symptoms by at least 50%. Examination of their data shows a direct relationship between efficacy and compliance. The more a subject practiced at home, the greater the benefit from the relaxation.⁴⁸

In summary of this chapter, authors indicate that progressive muscle relaxation (relaxation training) is effective in treating tension headache, but only to a limited degree. Biofeedback or EMGBF also proves to be equally or more effective than relaxation. One important aspect arising from examination of the literature is that EMGBF is not limited to using just the frontalis muscle for treatment, but the trapezius as well. Much of the literature encourages finding different techniques that could be equally as effective such as using different EMG sites for biofeedback and using different muscle groups for relaxation. Also to be brought out of this chapter is that it may be more beneficial to combine both biofeedback and relaxation training in the treatment of tension headache.⁴⁵ It is also important to keep in mind that responses may be different depending on type of

headache. The chronicity of the tension headache may have an impact on the final results as shown by the study by Richman and Haas.⁴¹ They show that despite two hours of frontalis EMGBF and relaxation, the continuous chronic tension type headache was unaffected.

CONCLUSION

According to literature reviewed, all of the techniques discussed for use in treatment of tension-type headache are beneficial. The focus now shifts to determining which treatment is the best. All of the techniques discussed can be performed by a physical therapist, and most of the needed equipment is readily available in most therapy clinics. Care must be taken in selecting the appropriate treatment option so that a patient does not receive treatment that may not be of benefit. Therapists need to keep in mind that every patient reacts to treatment differently and what may work for one patient may not work for another.

Diagnosing a patient's headache is not the responsibility of the physical therapist, but it is beneficial to be aware of common indicators of different kinds of headaches. The key characteristics of tension type headaches are as follows: 1) Patients will often complain of bilateral pain that is not associated with nausea and vomiting. 2) Activity will not increase the symptoms which are most commonly described as band-like tension around the head and pain in the musculature of the upper back and neck. 3) Precipitators of attacks are poor posture, stress, and vertebral dysfunction. Furthermore, a knowledge of the possible mechanism of tension type headaches offers insight and may promote improved treatment.

It is difficult to compare different treatment methods because the results are not gathered in a similar fashion. Generalizations, however, can be made to help determine the most effective option for treatment. By doing this it can be stated that perhaps the least effective means of treating tension headaches is progressive muscle relaxation. It is not to say that this treatment is not effective, but in comparison, it fails to achieve similar results. Other setbacks of relaxation techniques is the time it takes to treat a patient and the emphasis on patient compliance. A major focus of this treatment is patient practice at home. Even

when a therapist provides optimal care, it is not guaranteed to be effective if the patient does not comply to home practice.

The treatment of headaches with biofeedback is quite effective, for both tension and migraine headaches. The combination with EMG makes it an even more effective treatment. As shown by the literature, EMGBF is effective in decreasing headache intensity, frequency and muscle tension. This form of treatment is effective because it aims at relaxing the muscles that are tense which are thought to be causing the headache. By decreasing muscle activity, EMGBF is treating more of the cause than just the symptoms. The setbacks of this treatment include lack of long term benefits, length of treatment session, and emphasis on patient compliance. Unfortunately, no literature reviewed offered support of long term relief following termination of treatment. Also to be considered is the combination of both EMGBF and muscle relaxation. The use of these two treatments together have been shown to be superior to either treatment alone.

The treatment option providing a limited amount of benefit is electroacupuncture. The main problem with this treatment is that only the symptoms are being treated rather than the cause. The treatment provides a local response or sense of analgesia, but does nothing for the amount of muscle tension or cervical dysfunction if present. Electroacupuncture, like EMGBF and relaxation training, is not effective on tension headaches of cervical origin or vertebral dysfunction. It may help with perception of pain, but do not eliminate the problem. This is not to say that electroacupuncture should be the last line of treatment, but it is evident that it is not as effective as spinal manipulation and physical therapy.

The spinal manipulation techniques discussed in this paper are very effective in treating headache parameters associated with tension headaches. The key to this treatment is that in order to be of optimal effect, the headaches must be of cervical origin. If the patient's problem is not structural, use of spinal manipulation may lead to dysfunction of healthy structures and tissues. If evaluation reveals a problem in the cervical vertebrae, then

manipulation is the treatment of choice. As far as which specific technique is superior, it will be up to the therapist to determine what is most effective.

Finally, traditional physical therapy is also very effective in the treatment of tension-type headache. Perhaps the biggest plus for this treatment is its versatility. It has been proven to help treat a wide array of speculated causes. For example, if it is a muscular complication, traditional physical therapy aims at correcting the problem rather than just incorporating modalities to mask the symptoms. Whether it be massage, stretching, or muscle training, physical therapy treatment focuses on the root of the problem. By incorporating these techniques, a person may also learn to improve posture, general health, and responses to stress. In the reviewed literature, these factors and others have been shown to precipitate tension headaches, and traditional physical therapy has been shown to significantly reduce the headache parameters (duration, intensity, and frequency) as well as muscle tension and tenderness.

There is no one right treatment for every kind of tension type headache. It is ultimately up to the physical therapist to decide which patient will benefit from which treatment based on clinical findings, patient response, and overall efficacy of each individual treatment. If it were to be said, as a general guideline only, the most effective treatments appear to be, as shown in the literature, traditional physical therapy and spinal manipulation.

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