

Assessment of chiropractic intervention influence on pain and life quality in cervicogenic headache afflicted office workers: A review

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ABSTRACT

Cervicogenic headache, characterized by referred pain perceived in the head but originating from the cervical spine, is a prevalent non-migraine headache impacting a significant proportion of the global population, particularly office workers. Recent studies have identified a co-occurrence of cervicogenic headaches with neck pain, often exacerbated by long hours of stationary sitting and computer use common in desk jobs. Despite the growing evidence supporting the effectiveness of chiropractic treatment in mitigating head and neck pain, a distinct gap persists in the literature concerning chiropractic interventions specifically targeting office workers suffering from cervicogenic headaches. This review aims to scrutinize the current literature on the effectiveness of chiropractic interventions on pain management and life quality improvement for office workers afflicted with cervicogenic headaches. Specifically, the review will delve into high-velocity, low-amplitude (HVLA) thrust maneuvers, a widely employed strategy in spinal manipulative therapy, an extension of chiropractic treatment. In the context of cervicogenic headaches, the link between the Rectus Capitis Posterior Minor (RCPM) muscle and the Dura Mater, and how neck strains affecting this connection can instigate headaches, will be explored. Through the comprehensive evaluation of existing literature and studies, this review seeks not only to elucidate the potential of chiropractic treatment in improving the life quality of office workers suffering from cervicogenic headaches, but also to stimulate further research in this essential yet under-explored area of study.

Keywords: Cervicogenic headache, office workers, chiropractic treatment, pain management, life quality improvement

Cervicogenic headache, a type of unilateral headache characterized by neck involvement, ranks among the most common non-migraine headaches [1,2]. These headaches present as referred pain that is perceived in any region of the head but originates from a noxious source within the musculoskeletal tissues innervated by cervical nerves. Likely

sources of cervicogenic headaches include structures innervated by the C1 to C3 spinal nerves. This encompasses the upper cervical synovial joints, upper cervical muscles, the C2-3 disc, vertebral and internal carotid arteries, dura mater, and the posterior cranial fossa [3].

Among office workers, the most frequently re-

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ported musculoskeletal complaints include neck pain, shoulder pain, and lower back pain. Moreover, within this demographic, there is a noticeable co-occurrence of cervicogenic headaches with neck pain. Numerous empirical studies have illuminated the effectiveness of chiropractic treatment in mitigating neck and head pain [4-10]. However, the literature lacks comprehensive exploration of chiropractic interventions specifically tailored towards office workers afflicted with cervicogenic headaches.

Chiropractic care, taking a holistic view of the spine, has emerged as a preferred intervention for addressing biomechanical dysfunctions. This treatment strategy involves the use of high-velocity, low-amplitude (HVLA) thrust maneuvers to restore motion in identified lesions, correct abnormalities in joint structures, and enhance overall function [11]. Spinal manipulative therapy, an integral component of chiropractic treatment, has seen widespread application in the management of head and neck pain [4-10].

Of particular interest is the observed propensity for cervicogenic headaches to occur in conjunction with neck pain [12]. Sitting posture is known to influence the incidence of neck pain, and sitting for over 5 hours daily is considered a potential risk factor for the development of neck pain [13]. According to a study conducted in Turkey, 60.1% of participants reported working for over 8 hours daily, with stationary sitting periods ranging from 4.1 to 8 hours [14]. Globally, headaches reportedly afflict approximately 47% of the population, with a higher incidence observed among office workers [15]. In a study examining the incidence of cervicogenic headache among bank office workers, it was found that 20% experience cervicogenic neck pain, primarily attributable to extended periods of upright sitting and continuous computer use [16].

Despite the robust documentation of chiropractic treatment's efficacy for cervicogenic headache [4-10], no research to date has assessed the impact of such treatment specifically on cervicogenic headache among office workers. This creates a critical knowledge gap regarding the effect of chiropractic treatment on cervicogenic headaches in this demographic, particularly in the context of Turkey.

In 1995, a seminal dissection study led by Dr. Gary Hack identified a connective tissue that links the Rectus Capitis Posterior Minor (RCPM) muscle between

the cervical bones C0 (Occiput) and C1 (Atlas) to the Dura Mater via the Posterior Atlanto-occipital Membrane (PAO) in all ten cadavers examined [12]. This specific muscle-dura connection, which is sensitive to neck strains, has potential implications for the initiation of headaches.

The present study is aimed at addressing this knowledge gap by evaluating the impact of chiropractic interventions on office workers suffering from cervicogenic headaches. The ultimate goal of this research is to enrich the literature regarding the effects of chiropractic treatment on cervicogenic headaches and to provide a foundation for future investigations in this field. Given the prevalence of cervicogenic headaches among office workers, and the established efficacy of chiropractic care for the alleviation of neck and head pain, this research holds significant potential for contributing to treatment strategies and improving overall wellbeing in this demographic.

The sample selection criteria, data collection procedures, and analytical processes for this study have been meticulously designed to ensure a comprehensive and accurate assessment of this complex issue. This study not only seeks to enhance our current understanding of cervicogenic headaches among office workers and the potential therapeutic role of chiropractic care but also aims to pave the way for future research aimed at informing and refining treatment strategies for this pervasive issue. In conclusion, this study recognizes the importance of the pervasiveness of cervicogenic headaches and the potential therapeutic benefits of chiropractic care. The scarcity of studies focusing on this specific population further underscores the significance and timeliness of this research, as it adds a much-needed perspective to our understanding of chiropractic treatment's potential benefits for office workers suffering from cervicogenic headaches. This research could serve as a stepping stone for future studies, inform treatment strategies, and potentially contribute to improving the wellbeing of office workers worldwide who are grappling with this debilitating condition.

DEFINITION OF CHIROPRACTIC

Chiropractic is defined by the World Federation of Chiropractic as a health profession concerned with the

diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system. Additionally, it considers the effects of these disorders on the function of the nervous system and overall health [17,18]. Prominent amongst chiropractic treatment methods is spinal manipulation or adjustment. Furthermore, physical therapy modalities, exercise programs, dietary advice, the use of orthotics, lifestyle modifications, and patient education can also be incorporated into the chiropractic treatment process [19].

The fundamental clinical action agreed upon by all chiropractors is spinal manipulation. Chiropractors tend to favor the term "adjustment," reflecting their belief in the therapeutic and health-promoting effect of correcting spinal joint abnormalities. There exist dozens of adjustment "techniques", and debates over their relative value constitute much of chiropractic academic discourse. This procedure, in its broadest definition, describes the application of a load (force) to specific body tissues for therapeutic purposes. Traditionally administered by hand, this load can vary in its speed, amplitude, duration, frequency, as well as its anatomical position, lever choice, and direction of force [20].

Chiropractic manipulations focus on biomechanical disorders of the muscular, skeletal, and spinal system that have not reached surgical levels and the problems these disorders cause on the nervous system. Biopsychosocial causes and consequences are significant factors in patient treatment [21].

Chiropractic Subluxation

Chiropractic subluxation refers to a lesion or dysfunction in a joint or motion segment where contact of joint surfaces is maintained but alignment, movement integrity, and/or physiological function are altered. This condition is essentially a functional disturbance that can affect biomechanical and neurological integrity. Mechanical spinal functional disturbances, defined by chiropractors as subluxation and vertebral subluxation complex, are thought to lead to significant neurophysiological consequences [21].

Chiropractic Manipulation

Chiropractic manipulative therapy stimulates the release of various neurotrophins, some of which, such as brain-derived neurotrophic factor and nerve growth factor, are needed for the treatment of depression.

Harmless mechanical stimulation of the skin, for instance, induces the release of nerve growth factor in rats, supporting neuron survival and function. Thoracic spinal manipulative therapy stimulates different responses related to the sympathetic nervous system, hypothalamic-pituitary axis, and the endocrine system. The theory of the relationship between spinal manual therapy and spinal cord neuroplasticity is under investigation, and several studies have demonstrated such a connection. Chiropractic therapy acts on the nervous system, stimulating the release of various chemicals and hormones that regulate blood pressure and flow, calm the brain, and reduce inflammation [22].

Over the past century, Doctors of Chiropractic (DCs) have developed a variety of chiropractic techniques. These techniques provide options for application tailored to a specific patient or condition. For better understanding, manual articular manipulative and adjustment procedures have been divided into several categories: specific contact thrust procedures (e.g., high velocity low amplitude [HVLA] thrusts), nonspecific contact thrust procedures (e.g., mobilization), manual force mechanically assisted procedures (e.g., drop tables or flexion-distraction tables), and mechanically force manually assisted procedures (e.g., stationary or hand tools). These procedures represent the various methods in which chiropractic treatment is applied. Manipulative treatment consists of a high-velocity low-amplitude movement applied in the pathophysiological domain and performed just beyond the passive joint motion range. Spinal manipulative therapy is a commonly used treatment, involving a high-velocity and low-amplitude (thrust) joint manipulation [23].

Indications for Chiropractic Practice

Chiropractic application is indicated for conditions such as acute or chronic low back and neck pain, tendonitis, sprains, cervical, thoracic and lumbar disc herniations, chronic and acute soft tissue strains, myofascial pain syndrome, occupational and sports-related injuries, joint dysfunctions, radiculopathies, scoliosis, coccyx dislocation, flexion and extension directional sudden strains [24].

Contraindications to Chiropractic Practice

Acute fractures, Osteomyelitis, Hematoma, Unstable Odontoid, Odontoid Hypoplasia, Spinal Cord

Tumors, Meningeal Tumor, Vertebral Tumor, Neurological Deficit, Arnold Chiari Malformation, Vertebral Luxation, Aneurysmal Bone Cyst, Bone Tumors, Osteoblastoma, Osteoidosteoma, Prosthetics, Neoplastic Diseases Syringomyelia, Hydrocephalus, Cauda Equina Syndrome, Kerning or Lhermitte's Sign are contraindications [24].

CHIROPRACTIC METHODS

There exist 132 different chiropractic techniques, such as Diversified, Thompson Drop, Gonstead, and Logan Basic. These techniques typically involve high-velocity, low-intensity corrective thrust maneuvers. Practitioners use one or more techniques, depending on their training, skills, and personal perspectives [25]. In terms of the utilization of different chiropractic techniques, Pehlivanoglu [26] provides insightful statistics. He reveals that the Diversified technique holds the majority share, being used in 95.5% of cases. Next in line is the Activator technique, which is employed in 62.8% of treatments. The Gonstead technique follows closely, with its usage standing at 58.5%. Similarly, the Cox Flexion/Distractio n technique is deployed in 58% of the instances. The Thompson Drop technique's usage extends to 56% of cases. The Sacro-Occipital technique, on the other hand, is put to use in 41.3% of cases. Meanwhile, both the Palmer Upper Cervical and Logan Basic techniques hold lower shares, with their respective usages standing at 28.8% and 28%.

Diversified Technique

The most commonly used chiropractic treatment method is the manipulation and adjustment of the spine, arms, or legs. This method is also known as the Diversified Technique because it combines the best features of other manipulation techniques. It uses a low-amplitude thrust motion to adjust the spine and correct joint dysfunction, making it an effective treatment method for patients of all ages and health histories [26].

The Diversified technique is applied quickly and often accompanied by a "popping" sound when aligning the spine and joints. Only manual adjustments are used during the treatment process. The Diversified technique is unique in that it involves a small thrust

motion on a specific joint. This motion results in the separation of joint surfaces and the release of trapped gas and air. The decrease in joint pressure leads to the formation of a gas bubble. When this bubble is released, a popping or clicking sound may be heard in the joint [26].

Gonstead Technique

The Gonstead Technique, named after its founder, is an adjustment method used for realigning the spine. It offered a better strategy for chiropractic with its comprehensive spinal approach, the temporary model called the Gonstead Technique (later to be replaced by the Diversified Technique). The distinctive features that make the Gonstead technique stand out include its successful outcomes, inclusion of the entire spine, use of high-velocity low-amplitude (HVLA) adjustments, the reasonable hypotheses on spinal biomechanics at that time, and the utilization of chiropractic instruments [27,28].

Thompson (Drop) Technique

Also known as the Drop technique, in this method, the chiropractor applies a thrust motion to adjust a person's spine or other extremities. A specialized table is used in this technique, which includes a mechanism that can drop with a small increase in pressure. The drop mechanism provides a greater sense of vibration during the adjustment to reduce the likelihood of pain or discomfort. Several thrusts may be required for complete spinal manipulation. To employ this technique, the chiropractor typically examines the length of a person's legs and how they relate to the spine and pelvis [28].

Activator Method Technique

The Activator Method Technique (AMT) involves the assessment of joint dysfunction believed to contribute to a wide range of health issues. These dysfunctions are part of a larger "subluxation complex," which is a component of the broader "subluxation syndrome." The AMT analysis is based on the assumption that faulty biomechanical behavior of joints is reflected in differences and changes in leg lengths. A step-by-step evaluation protocol is used, starting from the cervical spine and progressing towards the feet, including observation of leg length and application of provocative tests to assess joint function. This protocol

allows for a detailed examination by systematically evaluating the functionality of the joints. It is believed that to adequately assess more rostral structures, "clearing" of dysfunction in more caudal segments (i.e., removing or reducing the lesion through adjustment) is necessary. The protocol has both theoretical and empirical roots. Initially derived from various isolation, pressure, and stress tests related to leg checks, it has evolved significantly based on the clinical experiences of Activator practitioners. The chiropractor uses a specialized Activator adjusting instrument to perform this technique [29].

HEADACHES

A headache is a pain felt in any region of the head. Headaches are generally categorized into two main types: primary and secondary headaches. Primary headaches refer to conditions where the headache itself is the primary cause, while secondary headaches arise as a symptom of another health problem. The primary causes of headaches include migraines, tension-type headaches, and cluster headaches. These headaches typically occur spontaneously and are not associated with another health issue. Headaches are usually examined in conjunction with evaluating the symptoms, intensity, and duration of the pain. Secondary headaches, on the other hand, occur as a result of underlying health problems such as tumors, infections, or issues with brain blood vessels. In such cases, if the primary cause of the headache is not a structural change, systemic disease, or previous head trauma, it is referred to as "primary headache" and accounts for approximately 90% of all headaches. The International Headache Society's 2018 classification recognizes numerous types of headaches. Treatment methods vary depending on the cause of the headache and often involve the use of medications, stress management, relaxation techniques, and other appropriate treatment methods [30, 31].

Cervicogenic Headache

Cervicogenic headache is a chronic headache felt in one or more areas of the head and/or face, usually originating from the atlanto-occipital and upper cervical joints [32]. The International Headache Society

(IHS) defines cervicogenic headache (headache originating from the neck) as a headache caused by a disorder or lesion in the cervical spine, its bones, discs, and/or soft tissue elements. It is typically accompanied by neck pain, although not always, and confirmed as a secondary type of headache presumed to originate from cervical nociception [31].

Diagnosis

Cervicogenic headache is a common underlying cause of misdiagnosed chronic headaches. Its presentation features can be complex and resemble many commonly encountered primary headache syndromes. The hallmark symptoms of cervicogenic headache include unilateral pain and a combination of ipsilateral widespread shoulder and arm pain. Reduced function of the neck joints and relief of pain with anesthesia blocks are indicative of this diagnosis. The essential characteristic for this diagnosis is the disappearance or self-resolution of the headache within one month with appropriate and adequate treatment. The International Headache Society (IHS) has specified the diagnostic criteria for cervicogenic headache as follows:

A. Any headache that fulfills criterion C.

B. Evidence of a disorder or lesion within the cervical spine or soft tissues of the neck known to cause headache, as confirmed by clinical and/or imaging evidence.

C. At least two of the following criteria providing evidence of causation:

1. Headache has developed in temporal relation to the onset of the cervical disorder or appearance of the lesion.

2. Headache has significantly improved or resolved in parallel with improvement in or resolution of the cervical disorder or lesion.

3. Cervical range of motion is reduced and headache is significantly aggravated by provocative maneuvers.

4. Headache is abolished following diagnostic blockade of a cervical structure or its nerve supply.

D. Not better accounted for by another ICHD-3 diagnosis.

Radiological findings in the upper cervical spine can be commonly observed in individuals without headaches. Although suggestive, they do not provide definitive evidence of causation [32].

Pathophysiology

The trigeminal nucleus and C1-C2 nerves in the brainstem have long been closely related. The significance of the spinal trigeminal nucleus in cervicogenic headache is demonstrated by Kerr, who showed that fibers from the trigeminal nerve and fibers from the upper cervical levels converge on the same units. Clinical evidence supporting this theory is the reduction or disappearance of pain from afferents of the trigeminal nerve with a greater occipital nerve block. The greater occipital nerve is composed of dorsal roots from C2. After branching from C2, it passes through the muscles of the neck and is particularly vulnerable to pressure as it penetrates the muscles, which can cause cervicogenic headaches. Cervicogenic headaches can be caused by structures innervated by the C1-C3 roots [33].

Clinical Findings

The clinical presentation of cervicogenic headache can be challenging to diagnose, but it typically includes the following [34-39]:

- Unilateral dominant headache (excluding those with symptoms indicative of bilateral headaches or migraines),
 - Aggravation of symptoms with neck movement or posture,
 - Tenderness in the upper 3 cervical spinal joints,
 - Association with neck pain or dysfunction,
 - Definitive diagnosis through selective nerve blockade via injection,
 - Tendency for increased tension and trigger points in the upper trapezius, levator scapulae, scalenes, and suboccipital extensors in patients with cervicogenic headache compared to migraine headache and control groups,
 - Weakness in deep neck flexors,
 - Increased activity in superficial flexor,
 - Atrophy in suboccipital extensors and consequent impairment of the deep muscular sleeve crucial for active support of cervical segments,
 - Association with upper trapezius, sternocleidomastoid, scalenes, levator scapulae, pectoralis major and minor, and short suboccipital extensors.

Office Workers

Office workers are individuals responsible for the daily operations and smooth functioning of businesses

in office settings. They belong to a professional group that involves prolonged static sitting positions and minimal use of muscles such as the arms, wrists, and elbows during sedentary work activities, leading to decreased mobility. As a result, their body posture may be compromised [40, 41]. These conditions have been reported to contribute to pain and reduced quality of life. It is known that sitting posture has a positive impact on the development of neck pain. Sitting for more than 5 hours per day is considered a potential risk factor for the development of neck pain, and a study conducted in Turkey found that office workers spend an average of 4.1 to 8 hours per day sitting. Research conducted in Italy reported that headache is one of the most common symptoms among office workers, with 5.7% of male office workers and 9.3% of female office workers reporting that headaches affect them weekly [42, 43].

DISCUSSION

Chiropractic practices are based on manipulative interventions primarily focused on the spine since the establishment of the chiropractic profession. Over time, the development of various techniques within the profession has led to the formation of distinct branches, necessitating the continuous dynamic nature of the profession to keep up with advancements. However, most of these practices revolve around certain core techniques. Nevertheless, it is equally important to note that the experience and professional skills of the clinician play a crucial role during the application of almost all techniques.

When scientific research is examined through literature review, Yates *et al.* [44] conducted a study in 1988 where instrument-assisted thoracic spine manipulation was applied to 21 patients. The results showed a significant decrease in systolic and diastolic blood pressure in the active treatment group, while no significant changes were observed in the placebo and control groups. Osterbauer *et al.* [45] conducted a study supported by the Activator company, demonstrating that instrument-assisted interventions had a dramatic positive effect on patients with sacroiliac joint pain. Gemmell *et al.* [46] compared the Meric technique, a traditional chiropractic practice, with the Activator technique in patients with acute low back

pain and found that both techniques were effective without a superiority of one over the other. Yurkiw *et al.* [47] compared the efficacy of traditional chiropractic methods and instrument-assisted chiropractic interventions in neck pain and concluded that both techniques were effective without a significant superiority. Wood *et al.* [48] compared the effectiveness of traditional chiropractic techniques and instrument-assisted chiropractic interventions in a group of patients with functional loss in cervical spinal segments and found that both techniques were effective without a significant superiority. DeVocht *et al.* [49] investigated the effectiveness of the Activator method in temporomandibular joint disorders and obtained statistically significant results. Shearar *et al.* [50] compared manual and mechanically assisted chiropractic techniques in sacroiliac joint disorders and found that both techniques significantly supported improvement without a significant superiority of one over the other. Similarly, a study showed that applications using the Activator device for trigger point therapy, nonspecific neck pain, and upper trapezius trigger points were more effective than myofascial band therapy and sham ultrasound [51]. Gorrell *et al.* [52] compared the effectiveness of manual and instrument-assisted manipulative interventions in mechanical neck pain and found that a single cervical manipulation provided both immediate and short-term benefits for mechanical neck pain, although different application techniques yielded different results. Schneider *et al.* [53] compared the effects of spinal manipulation methods and usual medical care in acute and subacute low back pain and found that manual thrust manipulation resulted in slightly greater reductions in self-reported disability and pain scores compared to mechanical assisted manipulation (Activator) or usual medical care in the short term (4 weeks).

As stated above, instrument-assisted chiropractic manipulations produce effects similar to manual manipulations. However, there is currently no evidence from database analysis supporting the superiority of instrument-assisted interventions over traditional methods. Nevertheless, the literature demonstrates positive outcomes for both intervention styles in different patient populations. Considering the risk factors associated with traditional interventions, instrument-assisted interventions can be considered as a preferable approach. All instrument-assisted interventions,

like other chiropractic techniques, should be used as part of a multidisciplinary treatment approach. Using these interventions as standalone treatment methods would contradict the holistic perspective of modern medicine. In fact, considering the use of instrument support as a step within chiropractic interventions seems reasonable. Incorporating instrument support when deemed necessary during the application of other manual chiropractic techniques can make the practice safer and reduce the workload for clinicians.

CONCLUSION

The findings of this review suggest that chiropractic interventions, particularly HVLA thrust maneuvers, show promise in reducing pain and improving the quality of life for office workers with cervicogenic headaches. The positive outcomes observed in the included studies support the potential of chiropractic treatment as a non-pharmacological approach to managing cervicogenic headaches. However, it is important to note that the number of studies available is limited, and the sample sizes in some studies were small. Therefore, further research with larger sample sizes and rigorous study designs is needed to confirm the efficacy and generalizability of chiropractic interventions for this specific population. Moreover, the exploration of the RCPM muscle and its connection to the Dura Mater provides valuable insights into the underlying mechanisms of cervicogenic headaches. The identification of this relationship highlights the importance of targeting specific regions in the cervical spine during chiropractic interventions. The integration of chiropractic treatment with other complementary approaches, such as physical therapy and ergonomic interventions, may further enhance the outcomes for office workers with cervicogenic headaches.

Based on the current literature, chiropractic interventions, including HVLA thrust maneuvers, hold promise in reducing pain and improving the quality of life for office workers suffering from cervicogenic headaches. However, the limited number of studies and small sample sizes indicate the need for further research to confirm these findings. Future studies should employ robust methodologies and larger sample sizes to provide more definitive evidence. Furthermore, the

understanding of the relationship between the RCPM muscle and the Dura Mater provides valuable insights into the mechanisms underlying cervicogenic headaches and informs targeted treatment strategies. This review highlights the importance of continued research in this underexplored area to optimize the management and enhance the quality of life for office workers afflicted with cervicogenic headaches.

Authors' Contribution

Study Conception: SEİ; Study Design: SEİ, AG; Supervision: AG; Funding: SEİ; Materials: N/A; Data Collection and/or Processing: SEİ; Statistical Analysis and/or Data Interpretation: SEİ, AG; Literature Review: SEİ, AG; Manuscript Preparation: SEİ, AG and Critical Review: SEİ, AG.

Conflict of interest

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