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# Neurodynamics of vertebrogenic somatosensory activation and Autonomic Reflexes - a review:

Part 9 Cervicogenic headaches

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Abstract: In the manipulative health sciences, cervicogenic headaches (CGH) has been a classic condition to be regarded as a somato-autonomic-visceral condition (Type O) as opposed to a musculoskeletal condition (Type M) such as low back pain. The patho-neurophysiology of CGHs leads to the probability of vertebrogenic associations at different segmental levels with other non-musculoskeletal conditions.

Indexing terms: Vertebral subluxation; Cervicogenic Headache; Cervical spine; Headache

# Introduction

H eadaches of vertebral-biomechanical origin were recognised by Palmer in his text of 1910, some 110 years ago. (1) An indication as to the frequency of chiropractic involvement in the management of headaches, the *Index to Chiropractic Literature* (ICL) has 414 listings for headache and 64 for cervicogenic headache under 'All Fields'. (2) Other sources exist in the chiropractic (3, 4, 5) and medical literature (6).

It was an observation as a 10-year-old about 1838 when AT Still, the founder of osteopathy, experienced relief of a headache by applying mild pressure under his neck while lying supine. This apparently led to it becoming one of the precedents for osteopathic treatment for the relief of migraines around 1874. (7) ...it seems clinically appropriate to consider the VSC as being a cervicogenic initiator of headaches'

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It is only in more recent years that allopaths adopted the vertebrogenic model of cervicogenic headaches. This biomechanical cervicogenic model is still

somewhat limited in medical circles although interest seems to be mounting. (8, 9, 10, 11, 12) However, the acceptance and use of medical spinal manipulation appears to be secondary to more invasive interventions. In 1956, almost 50 years after Palmer, the term cervicogenic syndrome was translated from a paper by Vitek, *'Craniocerebral and medullary cervicogenic syndrome.'* This appears to be the first mention of the term *cervicogenic* in the medical literature. (13) However, Gasik states that it was not until 2004 that cervicogenic headaches were first listed in the ICD-10. (14)

## A recent history

More formal recognition of headaches of neck origin came in 1983 when Sjaastad and colleagues introduced the term '*cervicogenic headache*'. (15) The term has since become widely adopted with some 498 listings on Pubmed, with some 657 on cervicogenic itself. (As at 22 April 2018.) Interestingly, on 17 April 2021 the figures were 604 and 824 respectively. (16, 17) The PubMed timeline for these terms reveal a significant increase in listings under these terms since 2000 and includes medical, chiropractic and osteopathic papers. (19, 20, 21, 22, 23, 24, 25, 26, 26, 28, 29) The earlier reticence shown by allopathic practitioners has not been explained (timeline +) (30)

In her 1966 text on *The Cervical Syndrome*, Jackson acknowledged that the cervical spine may be regularly associated with headaches when she stated, '*Pain in the head, or headaches, is a frequent complaint in cervical spine disorders.*' Travell also acknowledged the spine as an etiological factor in headaches when she designated the condition with the term mechanical headache. (31, 32)

Apart from dysfunction, other possible differential conditions are also considered during a diagnostic assessment involving the cervical spine. These include, disc ruptures, tumours, infections, arthritides and fractures, (33) These conditions however may not be suitable for manipulative intervention.

In citing these extensive series of papers from the 1960s, Professor Stuart Butler reported that Braaf and Rosner found that '*more than 90 percent of recurring headaches can be traced to a mechanical derangement of the cervical or neck portion of the spine produced by injury*.' (34, 35, 36, 37, 38, 39, 40, 41)

The term *cervicogenic* may also be associated with other conditions of neck origin including *cervicogenic dizziness*. (42, 43, 44) This may suggest that previously, this etiological factor has been overlooked by conventional modes of health care for decades, particularly in relation to cervicogenic headaches and cervicogenic dizziness.

In 1996, Edmeads noted the continued lack of recognition of the classification of cervicogenic headaches in medicine in North America. He also recognised cervical dysfunction as an etiological factor and noted manipulation as one of the interventions for management. (45)

Gallagher indicated that cervicogenic headaches have been recognised '*by physicians*' for over 100 years. (46) This claim is not supported by the PubMed time line. (30)

A 2009 controlled study by Bevilaqua-Grossi et al. noted a somatic spinal element in migraines with their finding that 45 female episodic migraines sufferers experienced a reduction in cervical range of motion. (47)

In recognising the neck as a headache and pain generator, Becker, in 2010, noted the symptoms may be referred to the orbits and the frontal region. (48, 49)

In 2020, Mehnert, submits that the C2-C3 vertebral level is responsible for 70% of cervicogenic headaches. (50) This is a sizeable difference to the figure proposed by Braaf and Rosner's 90%. (34) The cervical spine is still considered the major contributor an hypothesis which essentially endorses the century-old chiropractic model for the condition. (50)

Mehnert (51) also stated that:

- 4.1% of the population experienced cervicogenic headaches;
- > In patients who experienced severe headaches 17.5% were of cervicogenic origin; and
- ▶ 53% of patients experienced cervicogenic headaches following whiplash injury.

Dvorak and Wälchli note that up to 82% of headaches are cervicogenic. (51) In 2018, Khalili and Murphy stated that '*Manipulative therapy and therapeutic exercise regimen are effective in treating cervicogenic headache*,' with efficacy up to 80% less headache frequency. They also discuss more interventionist options. (52)

# The role of parasympathetic dysfunction

Parasympathetic dysfunction has been recognised by Millichamp and others as being associated with certain forms of headaches and migraine. They noted that children with migraine-equivalents may exhibit parasympathetic-associated neurological symptoms such as abdominal pain and cyclical vomiting. (53)

Peroutica identified a sympathetic nervous system involvement with migraines in conjunction with autonomic failure. (54) Thomsen et al and Rubin and others reviewed a migraine association with the ANS regulation of cerebral vasomotor tone. (55, 56, 57, 58, 59)

Other migraine symptoms which appear to be ANS-related include: (60, 61, 62)

- Allodynia
- Anorexia
- Auras
- Depression
- Gastrointestinal symptoms vomiting, nausea
- Hyperacusis
- Ophthalmoplegic migraine
- Photophobia
- Restless legs syndrome
- Vestibular symptoms
- Visual disturbances
- Vomiting
- Yawning

The International Classification of Headache Disorders (ICHD) published by the *International Headache Society* also categorises some 14 primary types of headache with many subclassifications. This publication lists '*Headaches of neck origin*' being classified as code 11.2.1 (cervicogenic headache), and 11.2.3 (Headaches attributed to craniocervical dystonia). This is an expansion from the first edition (1988), which stated '*Headache or facial pain associated with disorder of the cranium, neck...or cervical structure.... 11.2.1 Cervicogenic headache*.' (63, 64, 65, 66, 67, 68) This term first appeared in the ICHDs second edition in 2004, over 20 years after Sjaastad. (15) Headaches attributed to upper cervical radiculopathy including C2 or C3, are designated code 11.2.4. (68, 69)

In contrast to just addressing the nociceptive symptoms alone, in 2010, Yadla and colleagues at the *Jefferson Hospital* recognised the origin of this form of cephalgia. They noted that '*Although cervicogenic headache is a relatively common cause of chronic headache, it is often misdiagnosed or unrecognised. Presumably, this is due to the conventional understanding of headaches being "just" a pain.' This may also explain the comparatively delayed adoption of the cervicogenic concept as one of the etiological factors for some headaches, and a traditional diffidence towards the potential of vertebrogenic (subluxation) concepts. (70)* 

Flippen and Goadsby suggested in 2012 that there are 14 different types of headaches associated with a range of aetiologies. Interestingly, in contrast to Sjaastad, (15) not one of these was listed as Cervicogenic Headache. (71)

Apart from pharmaceutical regimens, other procedures have emerged in allopathic headache management through neurological approaches. These include more invasive procedures such as electro-neuromodulatory interventions also known as deep brain stimulation, (72) occipital nerve and sphenopalatine ganglionic stimulation, (73) nerve anaesthesia, (74) facet joint injection, (75) radiofrequency neurotomy, (76) and other interventions, (77, 78, 79, 80) as well as the less invasive transcutaneous vagal nerve stimulation. (81, 82, 83)

These measures appear to bypass or ignore the possibility of underlying biomechanical aetiology such as those initiated through segmental dysfunction in the cervical spine - the somatosensory activation of noxious spinal and cranial neural reflex circuits as discussed. These are typically addressed by conservative manual or instrument correction of the vertebral subluxations when present as a contributing factor.

Further examples of ANS influence are the range of migraine variants, not all of which are listed in the ICHD-II. This atypical list includes those without aura (acephalalgic migraine) and migraine equivalents. It also includes those with migraine designated symptoms other than with head pain – such as abdominal migraine. (84) However, still others remain unclassified. The number and variety of symptoms associated with these migraines also exhibit an ANS association.

The trigeminal system is recognised as an element in the trigemino-vascular model of this condition. (11, 12, 85, 86, 87) Goadsby recognises '*Trigeminal Autonomic Cephalalgia*' in an online presentation. (88) Another, the *neuronal theory*, involves paroxysmal depolarisation of cortical neurons as a further variant. Elchami et al state that the cervicogenic migraine '*is a secondary headache to an underlying structural problem in the head or neck*.' (89)

## Migraine

Other types of migraine include: (90, 91, 92, 93)

- Abdominal migraine
- Acephalgic migraine (Silent migraine aura without headache)
- Hemiplegic migraine
- Migraine with brainstem aura
- Retinal migraine
- Vestibular migraine

The importance of appropriate amelioration for migraine patients is an apparent association between migraine and suicidal patterns. This association has been noted since at least 1992 and tends to emphasise the necessity of the appropriate regimen for individual migraineurs and for inter-professional collaboration in the interest of patients. Failure to recognise that a cervicogenic migraine could have been addressed providing relief through manipulation in order to save such a life may be a lost opportunity for that patient. (94, 95)

Clinical trials of manual therapy for cervicogenic headaches compared with the usual conventional or allopathic care found distinctly in favour of the manual therapy patients. (96, 97, 98, 99, 100, 101)

As a further reflection on the potential influence of spinal manipulative care on the ANS, Jänig put forward the observation that '*Migraine and headaches with autonomic symptoms are accompanied by autonomic reactions which are dependent on activity in cranial parasympathetic neurons.*' (102) When cephalalgias and symptoms are ameliorated by cervical spinal adjustments

of biomechanical factors, more specifically, subluxations, Jänig's hypothesis would tend to be supported if not confirmed, albeit primarily as clinical observations. As Lewin says '*If the patient feels better, he or she probably is better.*' (103)

The previous conventional model for headaches virtually overlooks a possible somatoautonomic involvement of the documented cervicogenic element. The physiological-manual management of cervicogenic headaches provides a minimalist intervention model as a viable initial option for some patients. This may be as a conservative initial step, a trial of care, or the preferred option for patients who have previously experienced or have been recommended for manual care. (104, 105, 106, 107, 108, 109, 110)

It has taken many decades for allopathy to accept that disturbed spinal segments could even exist as a vertebral subluxation, or even as a significant factor in mechanical spinal pain.

From the chiropractic perspective it seems clinically appropriate to consider the VSC as being a primary cervicogenic initiator of a significant percentage (34, 50, 51) of headaches; after all, the VSC concept includes its biomechanical primary contribution to such pathoneurophysiological conditions associated with headaches.

This is a form of an autonomic-related somatovisceral disorder. (109, 112, 113, 114, 115, 116, 117, 118)

### Conclusion

We suggest that cervicogenic headaches would be a classic example of vertebrogenic symptoms of autonomic involvement. This demonstrates the neural factor in the complex associated with vertebral segmental disturbance.

Clinical case reports in the respective electronic indices ascribe similar neurological processes and other conditions at other vertebral levels, particularly the *Index to Chiropractic literature*.



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