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REHABILITATION OF CERVICOGENIC HEADACHE OCCURRING DUE TO ALTERED BIOMECHANICS AT THE CERVICAL AND THORACIC REGION

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ABSTRACT
A Cervicogenic headache (CGH) is a type of secondary headache that emerges from a nociceptive source like bony structures, tight fascia, or ligaments present in the atlanto-occipital and cervical joints. The generated pain is non-throbbing in nature and is usually perceived unilaterally in one or more than one region of the head and/or the face. The pain usually starts in the neck and the occiput region, which can radiate to other regions of the head, such as the forehead, orbital region, temples, and vertex, as stated in the early 1980s by a Norwegian neurologist named Ottar Sjaastad. The study aims to delay the occurrence of Cervicogenic headaches in an individual by correcting the biomechanics of the cervical joints. The International Headache Society (IHS) and the Cervicogenic Headache International Society Group's suggested Diagnostic Criteria for Cervicogenic Headaches are used as standard references for this publication (CHISG); also cervical flexion rotation tests are taken as standard references for this journal. Outcome measurements included; Numerical rating pain scale (pain intensity), headache frequency, and the Neck Disability Index (NDI) questionnaire. Postural correction plays an important role in the physiotherapy treatment of Cervicogenic headaches.

KEYWORDS: *Upper cross syndrome, Transgeminocervical nucleus, Breathing retraining, Postural correction*

1. INTRODUCTION

In the early 1980s, Ottar Sjaastad identified this headache, as arising from a nociceptive source present in the cervical region. Then in 1988, a society for Cervicogenic Headache was formed named the cervicogenic headache International Study Group (CHISG). (1)

In Cervicogenic headache, the prevalence for patients with chronic headache is estimated to be 15-20% and for the general population, it is ought to range from 0.4% to 2.5%. (2)

Cervicogenic headache is a distinct, chronic, and a type of secondary headache categorized by the international headache society (HIS) in 2004. (2)

Cervicogenic headache affects patients with a mean age of 42.9 years and males and females get affected with a ratio of 0.97 (F/M ratio) which shows that both have about the same chances of getting affected. (10,14) This headache is mostly found in people with age over 40 years old. The pain is referred from the upper 3 cervical spines via the upper three cervical nerves and afferent from the Transgeminal nerve in the Transgeminocervical nucleus (Bartsch and Goadsby 2003a, Bogduk 2004) and this is the only reason why many times it mimics the pain generated at the time of migraine. (3) The most prevailing differential diagnosis consists of migraine and tension-type headaches. (3,4) Pain is generated via the upper three cervical vertebrae due to the altered biomechanics of cervical vertebrae because of cervical Spondylosis or poor posture leading to exaggerated lordotic curvature of the cervical spine and changing cervical vertebrae angulation with each other and these changes are associated with the tight upper trapezius, sternocleidomastoid muscle and levator scapulae with the presence of trigger points in them.

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Initially, pain may show recurrent nature. It can then spread to one side (unilateral) of the patient's face and/or head with or without the involvement of one side of the eye. It then becomes almost continuous. [5][6]

There is no blurring of vision or dizziness with this type of headache but an aura will be experienced by the patient before having an actual cervicogenic headache. The intensity of pain is aggravated in cervicogenic headaches when the neck stays in the same position for a prolonged period.

The intensity of pain in the initial days will be low but with time the intensity of the pain will increase to become worse and can disturb the sleep pattern as well if left untreated.

2. CASE STUDY

A 47- year- old woman who works as a housewife started having moderate-intensity headaches 2 years back with upper back pain over time while denying any trauma, she acknowledged leading a sedentary life. The patient went to meet the physician regarding the same and he started his detailed clinical examination. The non-throbbing pain usually started from her cervical region with stiffness all around her neck with no associated symptoms like nausea, vomiting, blurred vision, or dizziness. Vital signs showed normal blood pressure, and heart rate with a normal temperature and then after some time, the pain started leading up to the occipital region of the head. Stress played an important role in aggravating the intensity of headaches. Despite doing a thorough clinical investigation that included a cardiac and neurological examination doctor was unable to pinpoint the exact reason for the patient's complaints so, along with the required physical examination, an X-ray was done to rule out any other potential causes of the deep, dull, non-throbbing pain in the head. However, other than functionally incorrect posture modifications resulting from her daily habits, no structural impairment was found. After some time, non-throbbing pain got deep and severe, and intermittent, lasting hours to days, and started referring from the neck to the occiput region followed by the one-side temporal region of the head. Later on, one eye also started getting affected by the pain i.e, the left side of the head got involved accompanied by the left eye. So, the patient went to see the ophthalmologist however there was no change in her eyesight, and no other red flag related to the neurological symptom was identified. The doctor suggested the patient do physiotherapy for the same. Then the patient came to see the physiotherapist again when the headache got more frequent with the severe intensity of pain because of which the patient's sleep was also getting affected.

3. ASSESSMENT AND TREATMENT

The patient approached the physiotherapist, during initial Sagittal and frontal plane postural analysis, it was observed that the patient had a slouched posture with rounded shoulders and was seen to have an asymmetry in the shoulder level when observed in the frontal plane. i.e., the dominant shoulder (right shoulder) was lowered in comparison to the other one and there was an apical breathing pattern with limited involvement of diaphragmatic muscles, forward head and neck protrusion, hyperlordosis at cervical and hyperkyphosis at the thoracic region and the scapulae have a modest winging.

Table 1. Demographic Data of the Patient with scale and tests performed in the first week

Characteristic	Value
Age	49
Gender	Female
BMI	28
NDI	32
NRPS	6
CFR Test	The patient had a lot of pain while performing this test and the rotational range of motion between C1-C2 came to be less than 45
DNFE Test	The Patient was not able to keep her occiput 2.5cm from the table for 30 seconds

(BMI: Body mass index; NDI: Neck disability index: NRPS; Numerical rating pain scale; CFRT: Cervical flexion rotation test; DNFET: Deep neck flexors endurance test)

On the dorsal side, the pectoralis major and minor were crossed with tightness in the upper
trapezius and levator scapula, and the deep cervical flexor weakness crossed ventrally with middle and lower trapezius weakness also There were some trigger points with grade 2 tenderness in the upper trapezius muscle. this muscular imbalance creates joint dysfunction, mainly at the atlanto-occipital joint, lower cervical spine joints (C4-5), glenohumeral joint, scapulothoracic articulation, and a few segments of the thoracic spine (T4-5).

Flexibility and muscle strength were also evaluated. Examination revealed that the antagonist muscle group's strength and flexibility were out of balance, which is a sign of "upper crossed syndrome.

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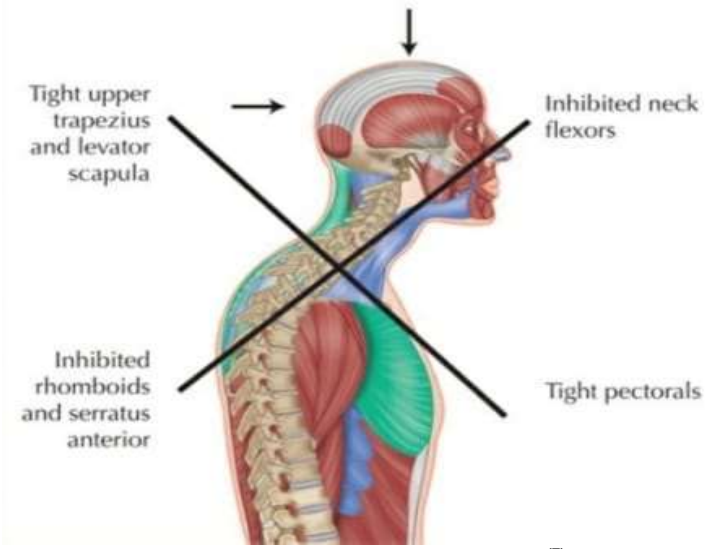

Figure 1: Upper crossed syndrome [7]

In the initial diagnosis of cervicogenic headache, a cervical flexion rotation test is performed which came to be positive. [8] The International Headache Society (IHS) and the Cervicogenic Headache International Society Group's suggested Diagnostic Criteria for Cervicogenic Headaches are used as standard references for this publication (CHISG). [9]

	International Headache Study Group[47]	International Headache Society[3]
Symptoms	• Unilateral headache without side shift • Ipsilateral neck, shoulder and arm pain of a rather vague, non-radicular nature • Pain episodes of varying duration or fluctuating, continuous pain • Moderate, non-excruciating pain, usually of a non-throbbing nature • Pain starting in the neck, eventually spreading to head, where the maximum pain is often located • Pain triggered by neck movement and/or sustained awkward position • Sustained neck trauma prior to the onset • Autonomic symptoms and signs (e.g. nausea, vomiting, dizziness, photo- and phonophobia, blurred vision)	A. Any headache fulfilling criterion C
Physical examination	• Reduced cervical spine range of motion • Symptoms on palpation of the cranium or neck • Anaesthetic blockades abolish the pain transiently	B. Clinical, laboratory and/or imaging evidence of a neck disorder, known to be able to cause headache C. Evidence of causation demonstrated by at least two of the following: 1. Headache has developed in temporal relation to the onset of the neck disorder 2. Headache has significantly improved in parallel with improvement in the neck disorder 3. Cervical range of motion is reduced and headache made worse by provocative manoeuvres 4. Headache is abolished following cervical diagnostic anaesthetic blockade
Other		D. Not better accounted for by another headache diagnosis

Figure 2: The Diagnostic criterion for Cervicogenic headaches proposed by The International Headache Society and Cervicogenic Headache International Society Group [9]

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Sessions after the initial evaluation were more action-oriented and focused more on the conventional structural biomechanical approach with a comprehensive corrective and rehabilitative exercise program for the upper-crossed syndrome. [10]

Three steps make up the design of the chosen exercises: Initial, improvement, and maintenance phases, including a 12-15-minute warm-up and a 10-minute cool-down after each exercise session.

Table 2: Conventional structural biomechanical approach exercises in the initial Phase

For the first two weeks (Initial Phase)
Headache Sustained Natural Apophyseal Glide with Headache (at the time of cervicogenic headache)
Functional release therapy for the upper Trapezius muscle
Static stretching for the levator scapulae muscle
Brugger's relief position

Table 3: Corrective exercises in the Improvement Phase

For the next three weeks (Improvement Phase)
Headache Sustained Natural Apophyseal Glide with Headache (at the time of cervicogenic headache)
Low load Endurance activities To train cervicoscapular muscles
Functional Release therapy and static stretching for upper Trapezius muscle and levator scapulae
Abdominal breathing exercise in the "beach pose posture"
Unilateral rotation SNAGs at C_1

Table 4: Corrective exercises in the Improvement Phase

For the next three weeks (Improvement Phase)
Headache Sustained Natural Apophyseal Glide with Headache (at the time of cervicogenic headache)
Blackburn exercises
Progressive abdominal breathing
Suboccipital soft tissue release

Table 5: Rehabilitative exercises in Maintenance Phase

For the next two weeks (Maintenance Phase)
Headache Sustained Natural Apophyseal Glide with Headache (at the time of cervicogenic headache)
Blackburn exercises
Suboccipital soft tissue release

The therapist started doing the treatment for the first week by stretching the tightened and shortened muscles to correct the altered length-tension relationship and for the same few manual techniques was applied to the patient mainly functional release therapy for the upper trapezius followed by static stretching of the levator scapula muscle, and central SNAG at the C1-C2 vertebral joint. Furthermore, to correct the slouched posture and to reduce the stress and tightness generated by the bad posture on the neck muscles "Brugger's relief position – in sitting" was performed 4-5 times per day for postural improvement. It helps in reducing strain on the back and cervical region; It encourages proper sitting posture and relaxed breathing. [11,12]

Headache Sustained Natural Apophyseal Glide with Headache(at the time of cervicogenic headache) is given from day 1 until week 11, it aids in resolving the positioning issue at the C2 level and may relieve the pressure that might be placed on the greater occipital nerve due to a tight fascia.

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For the next three weeks, the patient was asked to stop doing apical breathing and was made to do abdominal breathing (diaphragmatic breathing) in the "beach pose posture". This assisted her in maintaining a calm upper chest and facilitated the usage of the diaphragm muscle responsible for abdominal breathing. She was told to keep doing it every day at home for 15 minutes thrice a day to get a reducing effect on stress hormones. This abdominal breathing pattern is also used as a relaxation technique. Breathing exercises work to relieve stress by lowering the levels of serum cortisol that are released by the hypothalamus when people are under stress. It also has a direct impact on sympathetic activity and lowers the release of the hormone epinephrine from the adrenaline hormone. This allows ascendancy of the parasympathetic tone which results in an increased sense of lightness and blissfulness, decreased anxiety, and an increased threshold for stress perception. [13] [14]

This should be followed by low-load endurance activities for cervicoscapular muscles and the patient was asked to perform, 3 sets of 20 repetitions of each exercise daily to increase endurance and strength of the scapular muscles.

Consequently, it was self-reported by the patient that the frequency of cervicogenic headaches has been reduced but the intensity was not decreased much so for that, Unilateral rotation SNAGs at C_1 were performed at the time of headache to rectify the pathomechanics of the joints and further stimulate the proprioceptors and the mechanoreceptors in and around the lower cervical joints to ease the pain. Additionally, it aids in expanding joint play, which increases the joint range of motion. [15]

In the 6th to 8th week, the suboccipital soft tissue release technique is performed on the patient with the addition of Blackburn exercises. To increase endurance and strength of the scapular muscles, the patient was asked to perform 3 sets of 20 repetitions of each of these exercises thrice a day: Prone Horizontal Abduction (Neutral), Prone Horizontal Abduction (Full External rotation), Prone Horizontal Scaption (Neutral), Prone Horizontal Scaption (Full External rotation), Prone Horizontal External rotation. She was instructed to take a breather at the end of each exhalation to slow down her breathing, and because of her success with diaphragmatic breathing in the supine lying position, it progressed to sitting.

For the next two weeks, in Maintenance Phase rehabilitative exercise protocol, was made to ensure a full recovery. The patient was asked to perform 3 sets of 20 repetitions of each Blackburn exercise daily to increase endurance and strength of the scapular muscles. These exercises are important to maintain the scapula in a position, by maintaining the strength of the muscles around the scapula as in patients with rounded shoulders and hyperkyphosis it is seen that the position of the scapula gets altered.

The upper trapezius (UT) muscle demonstrated a considerable decrease in muscular hardness and an increase in pressure pain threshold. This is followed by suboccipital relaxation as the upper trapezius muscle gets originated from the superior nuchal line and external occipital protuberance and subsequently crosses across the suboccipital muscle. The suboccipital release technique has a direct impact on the upper trapezius muscle once it has been applied. As a result, the hardness of the muscles is reduced. [16] According to a study, the sarcomere's vertical width gets narrowed and elongates when ischemia compression is given to the myofascial trigger points, whereas the myofascial trigger point's area decreases following ischemic compression intervention. [17]

4. RESULT

Changes in the physical examination:

Neck disability index (NDI)
In the 11th week, the neck disability index score was 21 out of 50 after intervention i.e., mild disability

Numerical rating pain scale (NRPS)
In the 11th week, the score of the Numerical rating pain scale was 3 out of 10, which showed very less

Cervical flexion rotation test (CFRT)
After the 10th week, the patient had slight pain while doing a rotation with a passively flexed neck but the rotational range of motion between C1-C2 came to be 45

Deep neck flexors endurance test (DNFET)
The Patient was able to keep her occiput 2.5cm from the table for 30 seconds

Also, the patient provided positive feedback while rechecking the upper trapezius trigger points' intensity.

It was self-reported by the patient that the frequency of cervicogenic headaches has been reduced.

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5.DISCUSSION

Effectiveness of Test Measures

1. Neck disability index (NDI)

The efficacy and reliability (for the neck disability questionnaire) are fair to moderate regarding neck pain due to musculoskeletal issues or cervical radiculopathy.

It has been used in the clinical setting as well as in research settings related to neck disability or dysfunctional issues.

2. Cervical flexion rotation test (CFRT)

This clinical exam is allegedly biased to evaluate impairment in the C1-C2 motion segment. In the upper cervical segments, rotation is coupled with contralateral lateral flexion and vice versa. The alar ligaments limit rotation at the atlantoaxial joints. Approximately 50% - 58% of the cervical rotation occurs at the atlantoaxial joint. [18] This clinical evaluation has a high sensitivity and specificity to identify individuals with neck pain and headaches who also have upper cervical joint dysfunction.

6.CONCLUSION

Although Cervicogenic headache is mostly undiagnosed or misdiagnosed, by going through the International Headache Society Diagnostic criteria, an individual can diagnose this headache as distinct. Her cervicogenic headache was caused by an altered length-tension relationship of the scapular muscles, excessive postural muscle usage without sufficient relaxation, and ignorance of his discomfort in the thoracic and cervical regions. Physiotherapy was taken as a primary treatment for the concerned patient. Therapeutic exercises with postural correction in a sitting position played a crucial role in maintaining body posture and strengthening weak muscles and relaxing the tensed ones. Mulligan techniques (unilateral SNAG in the patient's lower cervical region and central SNAG at C1 and C2 joints) with mobilization were performed. Cranial-base release technique helped relieve tensed soft tissues around the joint and relieve stressed fascia at the atlanto-occipital region. Whereas, relaxation technique (diaphragmatic breathing) played an important role in relieving stress from the body's respiratory muscles and helped reduce the overall stress response generated by the body. Although consciously breathing via the diaphragm ultimately decreased the frequency of the headache, the intensity of the pain stayed the same. Distraction at the atlanto-occipital joint with lateral flexion, unilateral SNAG, and suboccipital soft tissue release technique showed an instant decrease in pain intensity in the orbital region when applied at the time of the cervicogenic headache. While postural impairment is frequent in those who lead sedentary lifestyles, it would be beneficial for future studies to concentrate on cervicogenic headache related to the upper crossed syndrome.

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