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[ORIGINAL ARTICLE]

Effect of Cervical Stabilization Exercises Versus Cervical Headache SNAG following Sensorimotor Retraining on Pain and Functional Disability among Cervicogenic Headache Patients: A Comparative Study

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ABSTRACT

Background: Aim- To study the effect of Cervical Stabilization Exercises versus Cervical Headache SNAG Following Sensorimotor Retraining on Pain & functional disability among Cervicogenic Headache Patients.

Relevance of study : C.E.H. leads to significant deteriorations in patient's quality of life. Manual cervical therapy has shown improvement in headache symptomatology.

Methodology : In this study, 30 patients with C.E.H. were selected, Group 'A' (n=15) & Group 'B' (n=15). The Cervical Stabilization Exercises Following Sensorimotor Retraining were given to Group 'A', & Cervical Headache SNAG Following Sensorimotor Retraining was given to Group 'B'.

Result : On intergroup comparison, Group A pre and post-diff Mean of NPRS was 2.4±0.7, N.D.I. was 4.8±3, HDI was 8.1±3.8 This compared with Group B pre and post-diff Mean of NPRS was 1±0.4, N.D.I. was 2.7±1.11, HDI was 5.4±2.5 with p-value of NPRS was <0.0001, N.D.I. was 0.0168, HDI was 0.0313.

Conclusion : Cervical Stabilization Exercises following sensorimotor retraining were more effective than Cervical Headache SNAG following sensorimotor retraining.

Keywords: *Cervical Stabilization exercise, Cervical Headache SNAG, Sensorimotor Retraining*

Introduction

Headaches related to the cervical spine are often misdiagnosed and treated inadequately because of confusing and varying terminology and are as often mistaken as other primary headaches, such as tension-type headaches and migraines. Cervicogenic Headache (C.E.H.) is diagnosed by physical examination and fulfilling the diagnostic criteria established by the International Headache Society in 1990[1]. Chronic hemicranial

A pain condition known as "Cervicogenic Headache" refers to the head caused by pain that starts in the cervical spine or soft tissues of the neck [2]. Several neck structures refer to pain in some or other part of the head that causes C.E.H. For example, apophyseal joints, atlantooccipital joints, annulus fibrous, cervical spine ligament, vertebral periosteum, cervical musculature, cervical nerve root, and nerve [3]. Cervicogenic

Headaches are a prevalent type of Headache that most commonly affects people between the ages of 18 and 30. Cervicogenic headaches are more common in females than in males, and approximately 16% of the population suffers from headaches. C.E.H. accounts for 15-20% of all chronic and recurrent headaches [4].

The pathophysiology of C.E.H. includes afferent Fibers of the trigeminal nerve entering the pons and descending in the spinal tract to the levels of C1 to C3. The trigeminal nerve's Pars Caudalis is the term for this. The pars-caudalis and dorsal horn of the upper 3 cervical nerves form a single functional nucleus called the “trigeminocervical nucleus.” This results in the convergence of the primary afferent

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fibres of the cervical spinal and trigeminal nerve. These convergences of afferent fibres indicate that noxious upper cervical stimuli can cause pain to be transmitted to an area usually innervated by the trigeminal nerve. Remarkably, the trigeminal nerve's ophthalmic division is the main part that descends into the pars caudalis. This branch innervates the area of the head where most C.E.H. patients complain of Headaches. The C1 spinal nerve has some ectopic sensory ganglia and innervates the short muscles of the suboccipital triangle[5]. Spinal nerve C2 provides sensory supply to the medial and lateral atlantoaxial joints; to several neck muscles (prevertebral, sternocleidomastoid, trapezius, semispinalis and splenius); to the dura of the posterior cranial fossa and the upper spinal canal. The C2 and C3 spinal nerves supply the zygapophyseal joints and discs of the adjacent segments. The atlantoaxial ligaments and the dura mater of the spinal canal are innervated by the sinuvertebral nerves stemming from the C1-C3 spinal nerves [6]. Significant signs and symptoms include unilateral head pain without side shift, crepitation, neck pain and restriction to passive neck movement[7,8]. Headache starts suboccipitally and subsequently spreads anteriorly to the frontotemporal and orbital regions. A dull, dragging, boring background pain of fluctuating intensity can be felt in a few minutes to several days[9,10]. Aggravating factors may include cervical extension and rotation to the side of pain. Relieving factors may be lying down, resting in a quiet room, massaging temples and sub-occipital region and stretching the sub-occipital muscles[11].

Patients experiencing neck pain seem to be more susceptible to impairment in the deep cervical flexor (D.C.F.) muscles (longus capitus and colli, rectus capitus anterior and lateralis, hyoid muscles) and deep cervical extensor (D.C.E.) muscles (semispinalis cervicis, multifidus, rectus capitus posterior major and minor[11]. These muscles have a high density of type I fibers and muscle spindles and are vulnerable to pain inhibition[12]. Patients with neck pain tend to have impaired D.C.F. activity and elevated superficial cervical flexor (S.C.F.; sternocleidomastoid [S.C.M.], anterior scalene) activity during cranio-cervical flexion[13,14]. For this exercise, the patient attempts to flatten the cervical lordosis, which requires D.C.F. contraction while minimizing S.C.F. activation[15]. The pressure device–assisted craniocervical flexion exercise was reported to be as effective at increasing cervical flexion strength as an endurance exercise program in patients with chronic neck pain[16]. Exercises for the D.C.F.s can be essential for patients with cervicogenic headaches, prone to poor D.C.F. strength and endurance[17] and weak cervical extensors[18]. Sensorimotor training methods are a current movement therapy trend and, for the first time, take into account the unique function of the neck by including connections between the sensations of sensory organs located in the head area and neck muscles[19-23]. chronic or recurrent neck disorders or neck pain secondary to cervical spine trauma are prone to deficits in head/neck repositioning acuity[24,25]. postural stability and oculomotor control -apparently due to impaired differentiation from cervical mechanoreceptors[26,27]. Patients with neck pain do not uncommonly experience symptoms of dizziness/lightheadedness and unsteadiness[28,29]. These symptoms are typically caused by postural instability and reduced proprioception, or the capacity to detect the position of the cervical joint[30–33]. Preliminary research suggests that sensorimotor training may be able to restore impaired cervical joint position awareness [34-37].

The concept of "mobilization through movement", known as the Mulligan concept, is quite different from other forms of manual therapy. Mulligan described persistent natural apophyseal gliding (SNAG) at the joint with active movement performed by the patient in the direction of symptoms. This glide should be pain-free, with proper force applied by a trained person[38]. The efficacy of SNAG C1-C2 has been proven in patients experiencing acute to subacute C.G.H. for both short and long-term periods[39,40].

Neck Disability Index (N.D.I.), Headache Disability Index (HDI) and Numerical Pain Rating Scale (NPRS) were used for evaluation of neck disability using information on pain intensity, ability for personal care, ability to lift things, ability to read books, Headache, concentration, work and activities of daily living (A.D.L.s)[41]

Methodology

A comparative study was conducted in physiotherapy O.P.D. at Dr Ulhas Patil College of Physiotherapy, Jalgaon. The Sample Size formula is,

$$n = \frac{- \ 2S2\,(Z1+Z2)2}{(M1 - M2)2}$$

A Comparative interventional study was conducted on thirty patients with Cervicogenic Headaches at Physiotherapy O.P.D., Dr Ulhas Patil College of Physiotherapy, Jalgaon. (Group A-15 & Group B-15).The study duration was 6 months.CTRI Registration No - CTRI/2024/02/062923. The criteria for inclusion were: 1) Age between 18-30 years, patients matching cervicogenic Headache diagnostic criteria established by the International Headache Society. 2) Unilateral or side-dominant Headache without side shift, 3) Headache with neck stiffness and pain, Positive flexion rotation test,4) Restriction of extension & rotation range of motion in the cervical spine, 5) Precipitation of headaches from neck movement or sustained head positioning, 6) Intermittent headaches of varying duration and pain level at the rate of one Headache per week for greater than 2 months, 7) Headaches of moderate intensity, 8) Tenderness on posterior side of neck. Subjects were excluded if they had 1) headache not of cervical origins such as tension-type or migraine, 2) Headache with autonomic involvement, dizziness or visual disturbance, 3) Congenital conditions of cervical spine, 4) Inability to tolerate flexion rotation test, 5) Cervical Radiculopathy, 6) Fracture or previous surgery on vertebral column, 7) spinal stenosis, disc prolapsed, 8) T.M.J. dysfunction, 9) Any neurological disorders, lower limb injury 10) problems with hearing, vestibular pathology, neurological deficits. Outcome measures were: 1. Neck disability index (N.D.I.) (0.92) 2. Headache disability index (HDI) (0.89) 3. Numerical pain rating scale (NPRS) (0.72)

Procedure: Ethical clearance was obtained from the institutional ethical committee of Dr Ulhas Patil College of Physiotherapy. The procedure & purpose of the study were explained to the participants. Subjects were screened according to the inclusion, exclusion and age-matching criteria. The participant's signed informed consent was obtained. A total of 30 subjects were included in the study. Selected participants were evaluated for the presence of cervicogenic Headache using a valid and reliable method - Flexion-Rotation Test. The subjects were assigned to one of two groups using simple random sampling (lottery method): Group A – 15 participants with Cervicogenic Headaches received Cervical stabilization exercises and Sensorimotor retraining. Group B – 15 participants with Cervicogenic Headache received Cervical Headache SNAG and sensorimotor retraining. Baseline measurements of NPRS (neck pain intensity), neck disability index (N.D.I.), and headache disability index (HDI) were first assessed to find the level of functional disability.

Evaluation of Cervicogenic Headache using Flexion-Rotation Test - The patient's head was passively rotated in each direction. At the same time, the examiner maintained the flexed position after the patient's neck was passively placed into complete flexion to pre-tension the structures of the middle and lower cervical spine. A 10-degree disparity in mobility between the painful and non-painful sides, R.O.M. restriction with firm resistance, and pain provocation are requirements for a positive test. The FRT-P has been found to have high sensitivity (90–91%) and specificity (88–90%) when used to examine patients with C.E.H.

Intervention

Group – A = All 15 participants of Group- A were assessed with a Flexion-rotation test and received Cervical stabilization exercises using a pressure biofeedback unit (P.B.U.) and sensorimotor retraining exercises.

Cervical stabilization Exercises using Pressure Biofeedback Unit (P.B.U.) -With the patient hook-lying and in neutral craniocervical spine alignment, a pneumatic pressure device is inflated to 20 mm Hg and placed between the upper cervical spine (below occiput) and table. The patient is told to strive to maintain the superficial cervical flexor (S.C.F.) relaxed while gently and quietly nodding their head as though saying "yes.". The nodding movement will flatten the cervical lordosis and increase device pressure. The clinician should monitor for unwanted S.C.F. activation, usually most apparent in the sternocleidomastoid (S.C.M.). The patient can place the tongue on the roof of the mouth, with lips together but teeth slightly apart, to decrease platysma and/or hyoid activation. Initially, the patient can practice controlling and varying pressure in the device. The patient should practice holding higher pressures as allowed until they can maintain 30 mm Hg for 10 seconds with little to no activation of the S.C.F. Dosage – 8-10 repetitions, 3 sets, 3 sessions per week on alternate days.

Fig 1 : Passive flexion rotation test

Fig 2 : Deep Cervical Flexors strengthening with Pressure biofeedback unit

Group B-All 15 participants of Group B were assessed with a Flexion-rotation test and received Cervical Headache SNAG and sensorimotor retraining exercises.

Cervical Headache SNAG

Procedure: Patient sits in a chair with the back supported and head/neck in neutral position. The therapist stands to the front and side of the patient. The therapist stabilizes the patient's head against their body. The therapist's middle phalanx of the little finger touches the posterior part of the patient's C2 spinous process. The therapist applies pressure to the opposing hand's little finger in a horizontal plane using the thenar eminence of their non-contact hand. This force is applied for ten seconds.

Dosage – 8-10 repetitions, 10 oscillations per minute, 3-4 sets, 3 sessions per week on alternate days for 5 weeks. Headache pain should be alleviated.

Fig 3 : Cervical Headache SNAG

Sensorimotor Retraining Exercises:

Exercises to Improve Oculomotor Control-Intervention is given for 5 weeks, 3 sessions per week on alternate days. total

Fifteen sessions lasted for 15 minutes, and each task was performed for 20 seconds with a 10-s break in between.

Exercises to improve oculomotor control

1) "Skywriting" or tracing patterns on the wall with eyes with head stationary	5-7 reps 3-5 sets	
2) Maintain a fixed gaze on the target while the head rotatespassively or actively. 3) Rotate your eyes and head to the same side in both left and right directions. 4) Move your eyes and head in opposite directions	5-7 reps 3-5 sets	
5) Maintain fixed gaze on target while weight shifting or rotating torso (passively andactively)	5-7 reps 3-5 sets	

6) Move eyes to target followed by a head witheyes remaining focused on the target. 7) Move your eyes, then head to look between two targets positioned horizontally or vertically.	5-7 reps 3-5 sets	

Exercises to Improve Postural Stability—The intervention is given for 5 weeks, 3 sessions perweek on alternate days.

1) Seated weight shifting on different surfaces(Swiss ball)	8-10 reps 3-4 sets	
2) Balancing on floor or labile surface (Mini trampoline, wobble board) with different stances (preferred, narrow, tandem, single leg)	8-10 reps 3-4 sets	
3) Standing weight shifting on varioussurfaces	8-10 reps 3-4 sets	
4) Moving upper extremities in differentpatterns while balancing 5) Playing “catch” while balancing	8-10 reps 3-4 sets	
6) Walking while rotating or flexing/extendingthe head	8-10 reps 3-4 sets	
7) Walking while balancing a foam pador pillow on the vertex of the head	8-10 reps 3-4 sets	

Statistical Analysis

A total of 30 participants were included in this study, of which 5 were men and 25 were women. The data obtained from the participants was statistically analyzed. The data on quantitative characteristics was presented as Mean ± Standard Deviation (S.D.) across the study group. The paired t-test was used for intragroup pre and post-comparison of the cervical stabilization exercises and SNAG groups. The unpaired t-test was used for intergroup comparison of the cervical stabilization exercises group and the SNAG group. The entire data was analyzed statistically using

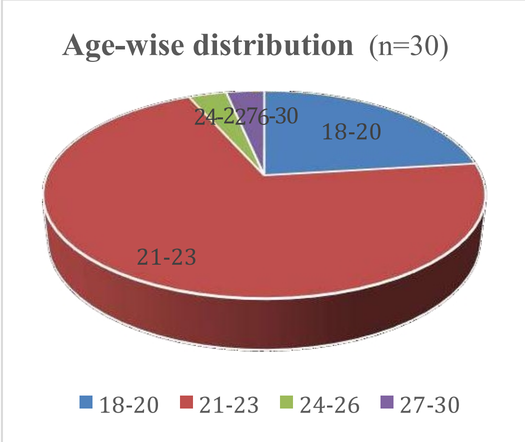
"GraphPad Instat version 3.05" for M.S.Windows.

Results

Statistical analysis was done with a paired t-test, and on intragroup comparison of pre and post-tests of each group, the 'P' value of NPRS, N.D.I., and HDI was found to be extremely significant (P value <0.0001). Statistical analysis was done with an unpaired t-test, and on intergroup comparison of Group A and Group B, the 'P' value of NPRS, N.D.I. and HDI was found to be significant with P value <0.0001, 0.0168,0.0313 respectively.

Table 1: The Age wise distribution of study subjects

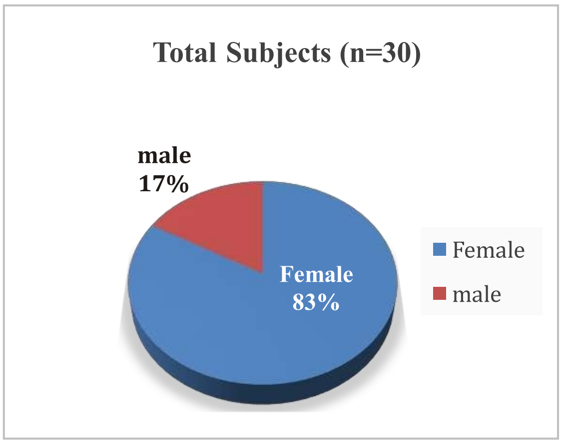
Age in Years	Age-wise distribution (n=30)
18-20	7 (23%)
21-23	21(70%)
24-26	1(3.3)
27-30	1(3.3)



Graph 1: The Age wise distribution of study subjects

Table 2 : Gender distribution of study subjects

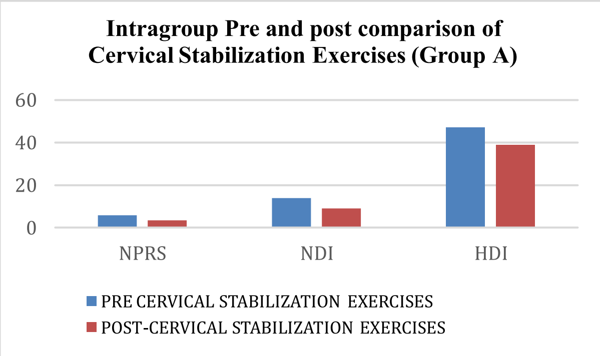
Gender	Gender distribution (n=30)
Female	25 (83%)
Male	5 (17%)



Graph 2 : Gender distribution of study subjects

Table 3 : Intragroup Pre and Post comparison of Cervical Stabilization Exercises Group (Group A)

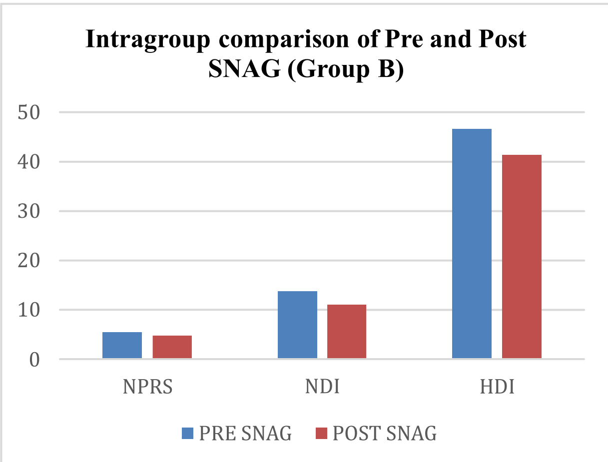
	Pre-Cervical Stabilization Exercises Mean & S.D.	Post Cervical Stabilization Exercises Mean & S.D.	p-value	t-value	Significance
NPRS	5.7±1.3	3.3±1.0	<0.0001	12.6	Extremely significant
N.D.I.	13.8±5.7	9±3.5	<0.0001	6.1	Extremely significant
HDI	47.1±13.1	38.9±12.3	<0.0001	8.1	Extremely significant



Graph 3 : Intragroup Pre and Post comparison of Cervical Stabilization Exercises Group (Group A)

Table 4. Intragroup Pre and Post Comparison of SNAG Group (Group B)

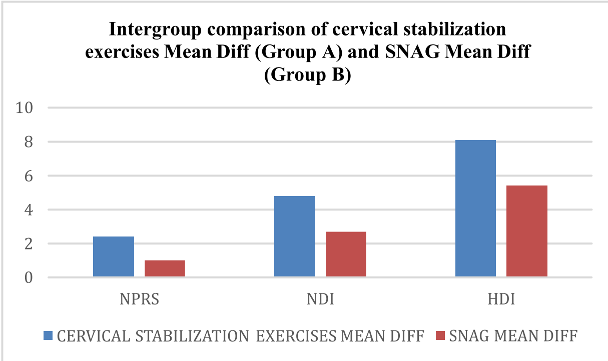
	Pre-SNAG Mean& S.D.	Post SNAG Mean& S.D.	p-value	t-value	Significance
NPRS	5.5±1.1	4.7±0.9	<0.0001	9.0	Extremely significant
N.D.I.	13.7±4.3	11±3.8	<0.0001	9.2	Extremely significant
HDI	46.6±10.7	41.3 ±9.5	<0.0001	7.8	Extremely significant



Graph 4 : Intragroup Pre and Post Comparison of SNAG Group (Group B)

Table 5: Intergroup comparison of Cervical Stabilization Exercises Mean Difference (Group A) and SNAG Mean Diff (Group B)

	Cervical Stabilization Exercises Pre and Post Mean Diff & SD	SNAG Pre and Post Mean Diff & S.D.	p-value	t-value	Significance
NPRS	2.4±0.7	1±0.4	<0.0001	5.9	Extremely significant
N.D.I.	4.8±3	2.7±1.11	0.0168	2.5	significant
HDI	8.1±3.8	5.4±2.5	0.0313	2.2	significant



Graph 5 : Intergroup comparison of Cervical Stabilization Exercises Mean Difference (Group A) and SNAG Mean Diff (Group B)

Discussion

Cervicogenic Headache causes a reduction in the strength and endurance capacity of the cervical muscles and neck pain. The prevalence of cervicogenic Headache was higher in females than in males. It has been found that specific muscles in the cervical spine tend to weaken in neck pain; the most common of these are the deep and anterior cervical flexors. The primary purpose of this study was to investigate the effect of Cervical stabilization exercise using P.B.U. Versus Cervical headache SNAG and sensorimotor retraining on pain intensity, headache frequency, functional disability in cervicogenic headache patients. There was a significant reduction in headache intensity, neck pain, and functional disability post-treatment in both groups. The study's results demonstrated that combining Cervical stabilization exercises using a pressure biofeedback unit (P.B.U.) and sensorimotor retraining brought more significant gains in outcome measures, including pain intensity and headache disability.

1) Effect of Cervical stabilization exercise on pain and Functional Disability

On intragroup comparison using paired t-test, the mean pre-treatment value of pain (NPRS) was 5.7±1.3, N.D.I. was 13.8±5.7 & HDI was 47.1±13.1 with post-treatment mean NPRS was 3.3±1.0, N.D.I. was 9±3.57 & HDI was 38.9±12.3 with p value was <0.0001 respectively. our study found that there was a significant reduction in neck pain and headache intensity as well as functional disability after cervical stabilization exercise, which includes strength and endurance training of deep neck flexors using a pressure biofeedback unit (P.B.U.). Mechanisms of pain reduction may explain this through exercises received by Group 'A'. The rise may reduce pain in endorphins that follow training and improve neuromuscular control. Muscle contractions activate muscle ergo-receptors (stretch receptors). Afferent from these muscles causes endogenous opioids to be released, as well as beta-endorphins from the pituitary gland. These secretions may cause both peripheral and central pain to be blocked [42,43]. Pressure biofeedback-guided D.N.F. exercise may provide external feedback to the patient regarding his task performance. Also Neck exercise using P.B.U. may allow the musculotendinous proprioceptors to downgrade their stretch reflex responses and increase the average firing rate, motor unit recruitment and synchronization of the active motor unit, improving muscle strength and performance by motor learning using multiple practice sessions. It is possible to reset the intrafusal fibres and break the cycle of tense muscles, poor circulation with metabolite buildup, and myogenic (myofascial) discomfort [44]. Since the deep cervical flexors, and the longus colli muscle in particular, lose their endurance capacity in the functional mid-ranges of the cervical spine in patients with neck pain, the more significant percentage of change in pain with the D.N.F. group may be based on the reduction in cervical impairment [45]. Deep cervical flexors play a significant postural role in supporting cervical lordosis. Iqbal et al.'s findings [46] demonstrated a substantial improvement in D.N.F. exercise with P.B.U. over physical therapy exercise for pain and disability using a numeric pain rating scale and N.D.I. This improvement occurred over the course of four weekly sessions for four weeks. Islam et al. [47] assessed headache frequency through the headache disability index, which agreed with the current study results. However, the traditional program was different. Islam et al. used moist heat, passive stretching, and manual traction as traditional treatments.

2) Effect of cervical headache SNAG on neck pain, Headache and functional Disability

On intragroup comparison using paired t-test, the mean pre-treatment value of pain (NPRS) was 5.5±1.1, N.D.I. was 13.7±4.3 &HDI was 46.6 ±10.7 with post-treatment mean NPRS was 4.7±1.0, NDI was 11±3.57 & HDI was 41.3±9.3 with p value was <0.0001 respectively. our study found that there was a significant reduction of neck pain and headache intensity as well as functional disability after cervical headache SNAG. According to the American Physical Therapy Association's (APTA) 2017 "Neck Pain Guidelines," cervical headache SNAG C1-C2 mobilizations are one of the most widely used manual therapy techniques proven effective in treating C.G.H. The APTA also reported that patients with neck pain and C.G.H. experienced significant improvement with these mobilizations over short- and long-term periods. Effect of SNAG mobilization on C.G.H. symptoms with associated vertigo by stimulating cervical joint mechanoreceptors and muscle proprioceptors and modulating abnormal afferent signals originating from the upper cervical spine. One possible mechanism by which SNAG C1-C2 cervical headache may reduce headache symptoms is through the neuro-modulatory effect of joint mobilization. According to the gate control theory, pain is inhibited at the spinal cord when mechanoreceptors in the joint capsule and surrounding tissues are stimulated. In addition, descending pain-inhibitory systems may be activated, mediated by areas such as the periaqueductal grey of the midbrain[48]. The results reported by Hall et al.[49]. Hall studied the effect of SNAG C1- C2 in 32 C.G.H. patients with limited F.R.T. who were divided into two groups. The SNAG experimental group saw a significant decrease in headache intensity and increased neck range of motion.

Sensorimotor retraining

It is established that neck pain can impair balance performance in people with idiopathic neck pain [50]. the influence of balance interventions on neck pain intensity has not been demonstrated before. The question remains: how sensorimotor function and pain perception are potentially interrelated? When considering sensorimotor circuits, the neural activity of Supraspinal centres after stimulation of foot proprioceptors (i.e., muscle spindles) were demonstrated to correlate with balance performance[51]. In particular, higher balance performance was associated with more significant activity in parietal, frontal, and insular cortical regions and structures in the basal ganglia. Similarly, training studies indicated that cortical structures (e.g., motor cortex, supplementary motor area) adapt in response to balance exercises[52,53]. It is proposed that processing in those structures is important to ensure balance control. Interestingly, some of these brain areas are also known to be involved in chronic pain processing[54]. Thus, some supraspinal somatosensory representations are closely related to sensorimotor function and pain perception. Pain can influence the corresponding somatosensory cortical representation of the painful body area and the sensorimotor information processing. However, balance training affected supraspinal structures responsible for sensorimotor control and pain perception[55]. Thus, the intention of the sensorimotor system is differently challenged during balance tasks than in consciously performed cervical relocation tasks. Therefore, it may be speculated that neck muscles are differently recruited during whole-body postural tasks and that the improved cervical joint position sense and reduction in cervical pain intensity may, therefore, differ in the present study from the mechanisms proposed in previous studies evaluating the effect of conscious relocation tasks on the cervical spine. Oculomotor exercises can be advanced from eye movements with the head immobile to trunk and/or head motions with a visual fixation on a target. These exercises are intended to improve eye/head coupling and gaze stability. These exercises can be more challenging by increasing the speed and range of eye, head, or trunk movements or altering backgrounds and visual targets. Exercises to improve oculomotor control have been shown to reduce dizziness and pain and to improve postural control, cervical R.O.M., and function. Postural stability exercises often progress from stable to labile surfaces and bilateral to unilateral stances. These exercises are not unique to cervical spine treatment, and other techniques for challenging postural stability can be incorporated. [S. Brent Brotzman, et al, 3rd ed] [56]. Konstantin Beinert et al.[57] studied similar results that show that balance training can effectively improve cervical sensorimotor function and reduce the intensity of neck pain.

3) Comparative effect of Cervical stabilization exercises and SNAG

On intergroup comparison using unpaired t-test, the Cervical stabilization exercise, (Group A) pre and post-diff Mean of NPRS was 2.4±0.7, N.D.I. was 4.8±3, HDI was 8.1±3.8 this compared with SNAG (Group B) pre and post diff mean of NPRS was 1±0.4, N.D.I. was 2.7±1.11, HDI was 5.4±2.5 with a p-value of NPRS <0.0001, N.D.I. was 0.0168, and HDI was 0.0313. Our study found that the cervical stabilization with sensorimotor retraining was more effective than SNAG with sensorimotor retraining. This may be because cervical stabilization exercises work with a dual mechanism, i.e., they control pain by the release of endogenous opioids & also may allow the musculotendinous proprioceptors to downgrade their stretch reflex responses using multiple practice sessions. In contrast, SNAG works on gate control theory to reduce pain & headache symptoms.

Conclusion

1. Cervical Stabilization Exercises following sensorimotor retraining were more effective than Cervical Headache SNAG following sensorimotor retraining on pain and functional disability among Cervicogenic Headache patients.
2. The null hypothesis is rejected in Favor of the alternative hypothesis. This study suggests that Cervical Stabilization exercise following sensorimotor retraining.
3. Has a more beneficial effect than Cervical headache SNAG following sensorimotor retraining.

Limitations

1. All outcome measures are subjective, but the deep neck flexor strength and endurance test can be taken as an objective outcome measure.
2. No long term follow up was taken

Future Scope

1. In Future studies, we can conduct a Randomized Controlled Trial with a larger sample size.
2. In future study we can assess cervical joint position sense for neutral head position (N.H.P.) and Rotated head position (R.H.P.).

Clinical Implication

Cervical stabilization exercises using a pressure biofeedback unit (P.B.U.) following sensorimotor retraining can be helpful in reducing pain and functional disability among Cervicalogenic headache patients.

Conflict of interest

No conflict of interest

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