



EFFECT OF NECK MOBILIZATION AND NECK ISOMETRICS IN CERVICOGENIC HEADACHE. A RANDOMIZE CONTROLLED TRIAL

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ABSTRACT

Cervicogenic headache (CGH) is a secondary headache resulting from cervical musculoskeletal dysfunction, involving muscles, joints, and nerves. Proper management is directed toward the restoration of cervical mobility, muscle tension reduction, and suppression of nerve irritation. The research compared the impacts of neck mobilization and neck isometric exercises in alleviating CGH symptoms. A randomized controlled trial was undertaken at Isra University, Islamabad Campus, and Social Security Hospital, Rawalpindi, involving 40 patients with CGH, randomly allocated into two groups of 20 each. A group received neck mobilizations, and the other did neck isometric exercises. Findings indicated that both interventions yielded notable improvements within groups. Headache Impact Test (HIT) identified significant decrease in headache intensity over time ($p < 0.005$). Between-group comparison revealed no overall significant difference, however mobilization evidenced superior outcomes. For the Neck Pain and Disability Index (NPDI), both groups manifested notable within-group improvement ($p < 0.005$). Between-group

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comparison identified no significant difference, but mobilization exhibited superior outcomes at baseline ($p=0.019$) and at the fourth week ($p=0.017$). The research concluded that both isometric exercise and neck mobilization are efficacious in treating CGH, with no general superiority of either procedure over the other. Mobilization was mildly superior at subsequent follow-ups, indicating it might offer faster or greater functional recovery in certain patients.

Introduction

Cervicogenic headache (CGH) is a secondary headache, caused by musculoskeletal dysfunctions of the cervical spine such as muscles, joints, discs, ligaments, and nerves of the neck.(1) Unlike primary headaches like migraine and tension-type headache, CGH results directly from a disorder in cervical structures.(2) Pain tends to be unilateral, non-throbbing, and dull, aching, or piercing. It is most commonly with the upper cervical spine, specifically C1–C3, which are intimately related to the trigeminocervical nucleus, a central convergence site where afferent input from cervical nerves and the trigeminal system merges.(3) The anatomical convergence accounts for why pain from the cervical spine can be referred to the head and face, simulating migraine-like or tension-type headache symptoms.(4)

Epidemiologically, CGH is a relatively frequent but under-diagnosed subtype of headache. It affects about 4–5% of the population at large and up to 15–20% of patients presenting in headache clinics.(5) On presentation, the patient has unilateral headache pain provoked by neck movements or prolonged poor posture. The pain can radially spread from the posterior head and neck to the frontal, orbital, or temporal areas.(6) Other symptoms may involve dizziness, phonophobia, ipsilateral eyelid swelling, visual impairment, and eye irritation, although nausea and vomiting are occasionally seen.(7) These co-occurring features overlap significantly with those of

migraine, and this overlap leads to the common diagnostic dilemma. Although there is this overlap, the findings in CGH have unique features like pain reproducibility with cervical palpation, limitation of neck range of motion, and disappearance of headache after diagnostic cervical nerve block.(8)

A number of well-validated instruments exist for measuring pain and disability in patients with CGH.(9) The Headache Impact Test (HIT-6) is a short questionnaire that is intended to measure the functional and psychosocial impact of headaches. It has been validated in various populations with headache, such as migraine and tension-type headache, and is equally suitable for cervicogenic headache.(10) HIT-6 scores not only indicate baseline disability but also enable clinicians to monitor treatment-induced change over time, thus making it highly beneficial in intervention studies. Likewise, the Neck Pain and Disability Index (NPDI) is a commonly employed measure to quantify cervical pain-related functional limitation.(11) By connecting neck dysfunction with headache-associated disability, NPDI presents an integrated overview of musculoskeletal contribution toward headache disorders.(12)

The pathophysiology of CGH focuses on the interaction between peripheral nociception and central sensitization. Abnormal cervical structures intervertebral joints, zygapophyseal joints, and related musculature produce nociceptive input via the upper cervical nerves.(13) These afferents synapse with trigeminal sensory inputs at the

trigemino-cervical nucleus, where they are processed and forwarded to higher centers. Sustained nociceptive input from cervical structures can cause hyperexcitability in this nucleus, producing decreased thresholds to pain, referred pain, and headache patterns of a chronic nature. Sustained musculoskeletal dysfunction also causes altered activation of the cervical muscles, with weakened deep stabilizing muscles and overactive superficial muscles, further contributing to mechanical stress and pain.(14)

Rehabilitation principles are key in the treatment of CGH since they address these underlying musculoskeletal dysfunctions directly. Manual therapy, particularly cervical mobilization, is a frequent intervention in physiotherapy.(15) Mobilization consists of the administration of low-velocity, passive oscillatory movements to hypomobile cervical segments.(16) The method enhances segmental mobility, decreases joint stiffness, and reduces mechanical loading on pain-sensitive structures.(17) Additionally, mobilization activates mechanoreceptors, increases proprioceptive feedback, and potentially activates descending inhibitory pathways, modulating pain perception both peripherally and centrally.(18)

Besides manual therapy, therapeutic exercise is an essential component in CGH management.(19) Neck isometric exercises consist of the static contraction of muscles without observable movement at the joints, working both deep and superficial cervical muscles.(20) Improved muscular strength, endurance, and stability from isometric training decrease the mechanical stress put on cervical joints and ligaments.(21) These exercises work especially well in patients with pain on dynamic motions, since isometrics offer muscle activation with the least irritation of sensitive tissues.(22) Clinical evidence indicates that isometric exercise not only alleviates pain but also restores functional stability of the cervical spine and even

abolishes headache attacks in some instances.(23)

Methodology

This randomized controlled trial was conducted in the Physical Therapy Department of Isra Institute of Rehabilitation Sciences, Islamabad, and Social Security Hospital, Rawalpindi, following approval from the Advanced Studies and Research Committee and participants' informed consent. Forty patients diagnosed with cervicogenic headache, both males and females, aged 20 to 40 years, were recruited through a non-probability convenience sampling method. Participants were randomized by lottery to two equal groups: Neck Mobilization Exercises group (n=20) and Neck Isometric Exercises group (n=20). Both groups were provided with a control physiotherapy protocol of hot pack treatment and TENS as baseline treatment. Moreover, the NME group was taught mobilization methods, wherein the therapist executed sustained glides at the articular pillar or spinous process level with three repetitions of 6–10 sets, whereas the NIE group executed isometric exercises of side flexion, neck extension, and neck flexion using hand pressure resistance and 5–10 seconds per repetition hold. Each session of treatment took 30–40 minutes and was performed five times during a four-week intervention period. Baseline data were collected, followed by weekly (1st, 2nd, 3rd, and 4th week), using a general demographic questionnaire, the Headache Impact Test (HIT-6), and the Neck Pain and Disability Index (NPDI) as outcomes. Statistical analysis was carried out on SPSS version 22, and the Shapiro–Wilk test was used to determine normality, independent sample t-tests were employed for comparing groups, and repeated measures ANOVA for within-group comparison. The results were presented as mean \pm SD, frequencies, and percentages, and a p-value of <0.05 was taken for statistical

significance. The design allowed longitudinal and cross-sectional measurement of treatment effects over the four-week duration.

Results

Demographics of study participants in both groups

Group		Mean	SD
Experimental (NME) (N=20)	Participant's Age	31.2000	5.91697
Control (NIE) (N=20)	Participant's Age	24.3500	2.97843

Both groups were comparable at baseline and no significant difference was found between ages, gender, height, weight, body mass index. The mean±SD of Participant's Age, is 31.2 ±

5.9 in Experimental Group. The mean±SD of Participant's Age is 24.3 ±2.97 in Control Group. Gender-based and BMI group- wise distribution are shown in table given below

HIT-6 in both groups

Week	NME (n=20)	NIE (n=20)
Baseline	Severe 90%	Substantial 85%
1st Week	Severe 75%	Severe 75%
2nd Week	Substantial 30%	Severe 50%
3rd Week	Little/No 45%	Severe 35%
4th Week	Little/No 90%	Mixed (25–30% each level)

Based on HIT categories, In Experimental group (NME), 18(90%) were having low physical activity and 0(0%) were having high physical activity. In Control group (NIS),

17(85%) were having low physical activity and 0(0%) werethose having high physical activity.

Neck Pain and Disability Index Categories

Week	NME (n=20)	NIE (n=20)
Baseline	Severe 65%	Moderate 40%
1st Week	Severe 65%	Moderate 40%
2nd Week	Moderate 70%	Moderate 40%
3rd Week	Mild 60%	Mild/Moderate 35% each
4th Week	Mild 50%	Moderate 40%

Based on NPDI categories, In Experimental group (NME), 13(65%) were having low physical activity and 14(70%) were having severe disability and 0(0%) have no disability.

In Control group (NIS), 7(35%) and 8(40%) were having severe disability and 0(0%) have no disability.

Discussion

Fernandez-de-Las-Peñas et al carried out an exhaustive study with the purpose of determining the most significant manual therapy (MT) techniques and methods for the treatment of cervicogenic headache (CH). Their outcomes emphasized that cervical mobilization elicited moderate-to-large improvements for headache severity and frequency compared to sham treatments, demonstrating its clinical utility in decreasing headache burden(24). These results are supported by our study, where mobilization as well as isometric methods showed extensive relief in symptoms of cervicogenic headache, validating the place of physiotherapy interventions in clinical practice.

Bizzini et al. also explored the effectiveness of strength training programs like neck isometrics and stretching exercises for patients with cervicogenic headache. The findings showed that isometric neck exercises generated moderate to large changes in headache frequency and intensity, especially in patients with chronic cervicogenic headache.(25) These findings support our study results, where isometric neck exercises were as effective as mobilization, and thus recommend non-invasive exercise-based therapies highly for the management of long-term headaches.

Recently, Mario Cedeño-Monge et al investigated the comparative effectiveness of manual cervical mobilization, isometric neck exercises, and combined treatment in chronic cervicogenic headache patients. According to their findings, the greatest improvement in headache intensity and frequency was obtained in the combination group, with almost 50% of the patients demonstrating a clinically significant improvement in headache symptoms.(26) Although our study showed both mobilization and isometric techniques each individually generated substantial improvements, Mario et al.'s findings suggest the possible synergistic

effect when using a combination of both. This indicates that future research must continue exploring integrative rehabilitation protocols since multimodal treatments may be more effective than singular techniques. In all, our study joins the increasing volume of evidence favoring mobilization and isometric exercises as efficacious treatment modalities for cervicogenic headache and suggests combination therapies as a fruitful avenue for clinical practice.

Conclusion

The study found that both isometric and mobilization methods had equally notable effects among patients with cervicogenic headache, with no particular method being more effective than the other. The findings indicate that both interventions are worthwhile in the alleviation of headache intensity, frequency, and accompanying disability, which makes them feasible physiotherapeutic interventions for use in the clinical setting. Cervical mobilization enhances joint mobility, eases muscle tension, and minimizes nerve irritation, whereas isometric exercises augment muscular strength, stability, and endurance, thus averting symptom relapse. The reproducibility of these findings in accordance with earlier research also supports their effectiveness, as it can be deduced that both methods offer secure and effective non-pharmacological treatment for cervicogenic headache. While both techniques are effective separately, future studies may consider whether there are benefits of combining mobilization and isometric training to achieve optimal therapeutic results. In conclusion, this study reaffirms neck isometric and mobilization methods as effective evidence-based interventions for the management of cervicogenic headache in everyday physiotherapy practice.

Limitations

- The main limitation of this study was the small sample size.

- Limited access to other hospitals due to permission issues
- Lack of patients coordination

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