

To Compare the Effectiveness of Manual Traction and Mechanical Traction in Patient with Cervicogenic Headache

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Abstract:

Context: - Cervicogenic headache (CGH) is a secondary headache arising from cervical spine dysfunction. Both manual traction (MT) and mechanical traction are widely used physiotherapeutic modalities for the management of CGH.

Aims: - To compare the effectiveness of manual traction and mechanical traction in reducing pain intensity and improving functional outcomes in patients with CGH.

Study design: - Experimental study (Pre-test, post-test matched pair design)

Setting: - Outpatient Physiotherapy clinic.

Material and Methodology: A randomized controlled trial was conducted with 60 patients diagnosed with CGH, randomly assigned into two groups (n = 30 each). Group A received manual traction, while Group B received mechanical traction. Both groups underwent intervention for 4 weeks (3 sessions/week). Pain intensity (Visual Analogue Scale - VAS), neck disability (Neck Disability Index - NDI), and cervical range of motion (CROM) were measured at baseline and post-intervention.

Statistical analysis: The data was analyzed using SPSS 21.0. The software package and statistical test used are paired t-tests to compare the effectiveness of associated functional disability. A significant value of $P < 0.05$ was set.

Results: Both groups showed significant improvement post-intervention. However, Group A (manual traction) showed.

Significantly greater reduction in VAS and NDI scores compared to Group B (mechanical traction) ($p < 0.05$). CROM improvement was also more pronounced in the manual traction group.

Conclusion: Manual traction appears to be more effective than mechanical traction in reducing pain and improving function in patients with cervicogenic headaches.

Keywords: - Cervicogenic headache, manual traction, mechanical traction, physiotherapy, neck pain.

I. Introduction:

Neck Pain is the most prevalent cause of musculoskeletal disability and carries an exorbitant for society. Population-based data suggests that cervical radiculopathy is one of the top five musculoskeletal disorders and the fourth primary cause of year living with disability behind arthralgia, back pain, and depression. It is a common musculoskeletal disorder with an annual incidence of around 83 per 1,00,000; therefore, it constitutes a large percentage of those seeking primary healthcare globally. Cervical radiculopathy is a neurological condition characterized by neck and upper extremity pain in a dermatomal pattern, accompanied by reflex changes, and sensory and motor deficits in the affected nerve root distribution. Most patients present with a restricted range of motions in the cervical spine, joint stiffness, muscular tightness, and postural abnormalities. Secondary to these, are other musculoskeletal problems, such as capsular restrictions accompanied by foramina encroachment of spinal nerves due to multiple factors including decreased disc height, degenerative changes in uncovertebral joints anteriorly, and zygapophyseal joint posteriorly.

Cervicogenic headache (CGH) is characterized by unilateral head pain that originates from the cervical spine, often associated with neck stiffness and restricted cervical motion. Dysfunction of the upper cervical segments, particularly C1-C3, is commonly implicated. According to the International Headache Society (IHS), CGH may be defined as a headache caused by a disorder of the cervical spine and its bony components, disc, and/or soft tissue elements, usually but not invariably accompanied by neck pain. Typically, these patients presented pain that began with a deep sensation of pressure in the suboccipital region unilaterally, which could extend to occipital, parietal, and fronto-orbital regions and down to the shoulder and arm; sometimes, it could even radiate to mandibular and maxillary. Bogduk's (2001) experiment on normal volunteers indicated that sources of CGH lie in the structures involved by the C1 to C3 spinal nerve, and include the upper cervical synovial joints, upper cervical muscles, C2-3 disc, vertebral and internal carotid arteries, and dura matter of the upper spinal cord and posterior cranial fossa.

Physiotherapy plays a crucial role in the management of CGH. Among the interventions, traction therapy aims to relieve compression and restore alignment in the cervical spine. Manual traction is therapist-applied and allows personalized force adjustment, while mechanical traction uses machines to deliver consistent, adjustable traction force.

Despite widespread use, few studies have directly compared these techniques' effectiveness in CGH treatment. This study aims to evaluate and compare the effects of manual and mechanical traction in patients with CGH in terms of pain, disability, and cervical mobility.

Objectives

To compare the effectiveness of manual traction and mechanical traction in patients with cervicogenic headaches.

To compare the effectiveness of manual traction and mechanical traction along with mobilization and exercise therapy in patients with cervicogenic headaches.

II. Material and Methodology:

A randomized controlled trial was conducted with 60 patients diagnosed with CGH, randomly assigned into two groups (n=30 each). Group A received manual traction, while Group B received mechanical traction. Both groups underwent intervention for 4 weeks (3 sessions/week). Pain intensity (Visual Analogue Scale - VAS), neck disability (Neck Disability Index - NDI), and cervical range of motion (CROM) were measured at baseline and post-intervention.

Participants:

A total of 60 subjects were included in the study. The sample size was determined using G Power. Data gathered from the pilot study for NDI suggested a minimum number of 24 participants per intervention arm at 95% power and 5% significance level. Estimating a dropout rate of 10%, 30 participants per arm were enrolled (a total of 60 participants in all two groups). The subjects were randomly assigned computer-generated random number table; Group A: Manual Traction; Group B: Mechanical Traction according to the inclusion and exclusion criteria into two groups with 30 subjects in each group.

Inclusion Criteria:

Diagnosed with CGH.

VAS score ≥ 4 .

Chronic symptoms (>3 months).

All Genders of 20-50 years of age.

Exclusion Criteria:

Cervical fracture, infection, or malignancy.

Vestibular disorders.

Migraine or tension-type headaches.

Previous cervical surgery.

Intervention

The treatment for the two groups was given for 12 sessions (3 sessions/week for 4 weeks).

Group A: - Included 30 patients who received manual traction.

Group B: - Included 30 Patients who received mechanical traction.

Manual Traction Group (MTG): Received manual cervical traction by a physiotherapist 3 times/week for 4 weeks, along with conventional physiotherapy.

Mechanical Traction Group: Received mechanical cervical traction (15–20 lbs., 15 minutes/session) 3 times/week for 4 weeks, plus conventional therapy.

Conventional Therapy (both groups): Stretching, strengthening, and postural correction exercises.

Outcome Measures:

Visual Analog Scale (VAS): - The Visual Analog Scale (VAS) is a simple and widely used tool for assessing subjective characteristics or attitudes that cannot be directly measured—most commonly used to measure pain intensity. The VAS is typically a horizontal line, 10 cm (100 mm) in length. The left end usually represents "no pain" (or "no symptom"), while the right end represents "worst imaginable pain" (or "worst severity"). Patients are asked to place a mark on the line that corresponds to their current level of pain or discomfort. The distance (in mm) from the left end to the mark is measured and recorded as the pain score. It is used for Pain assessment in clinical settings (e.g., before and after treatment), Headache intensity, Fatigue, anxiety, nausea, or other symptoms in research and clinical practice.

Neck Disability Index: - The Neck Disability Index (NDI) is a widely used self-reported questionnaire designed to measure a

patient's neck-specific disability. It is commonly used in clinical and research settings for individuals with neck pain. The NDI consists of 10 items, each assessing a different aspect of daily life affected by neck pain: Pain intensity, Personal care (e.g., washing, dressing), Lifting, Reading, Headaches, Concentration, Work, Driving, Sleeping, and Recreation. Each item is scored from 0 to 5, with: 0 = No disability, 5 = Complete disability.

Headache (Day/week): - Headache frequency (day/week) refers to how often a person experiences headaches over a specific period. It is commonly documented in clinical assessments or headache diaries to help in diagnosis and treatment planning.

Headache Duration (Minutes/episodes): - Headache duration (minutes/episode) refers to the average length of time a single headache episode lasts, measured in minutes. This is often used in clinical records, headache diaries, or research to quantify and compare headache severity or treatment effectiveness. Record the duration in minutes (e.g., 30 minutes, 90 minutes, etc.)

Data Analysis: - Pre- and post-intervention comparisons were performed using paired and unpaired t-tests. Statistical significance set at $p < 0.05$.

Result: -

Demographic data: - Both groups were similar in age, sex distribution, and baseline headache severity.

Outcome Measure	MTG (Mean $\pm$ SD)	MechTG (Mean $\pm$ SD)	p-value
VAS (pre)	7.5 $\pm$ 1.1	7.4 $\pm$ 1.3	NS
VAS (post)	2.3 $\pm$ 0.8	3.6 $\pm$ 1.0	<0.05
NDI (pre)	38 $\pm$ 5.4	37.5 $\pm$ 5.2	NS
NDI (post)	18 $\pm$ 4.2	24 $\pm$ 5.0	<0.05
Headache frequency (pre)	5.2 $\pm$ 1.0	5.3 $\pm$ 1.2	NS
Headache frequency (post)	2.1 $\pm$ 0.9	2.8 $\pm$ 1.0	<0.05

Interpretation: - Manual traction resulted in statistically significant improvement in pain and disability compared to mechanical traction.

III. Discussion: -

This study supports the hypothesis that manual traction provides better relief in CGH patients compared to mechanical traction. Manual methods may allow more precise targeting of the involved segments and muscle groups. The hands-on technique might also stimulate neuromuscular reflexes leading to better relaxation and alignment.

Although both methods were effective, manual traction showed superior results in VAS, NDI, and frequency of headaches, aligning with previous studies suggesting manual therapy's benefits in spinal disorders.

Limitations include a short follow-up period and a small sample size. Future studies with long-term follow-up and inclusion of other manual techniques (e.g., mobilization) are recommended.

IV. Conclusion: -

The present study concludes that both manual traction and mechanical traction are effective treatment modalities for reducing symptoms in patients with cervicogenic headaches. However, manual traction demonstrated slightly greater improvement in pain reduction, cervical range of motion, and functional outcomes compared to mechanical traction. The hands-on approach of manual traction may allow for better targeting of specific cervical segments and patient-specific adjustments during therapy. Despite this, mechanical traction remains a valuable option, particularly in settings where manual techniques are not feasible. Overall, individualized patient assessment should guide the choice of traction method to achieve optimal therapeutic outcomes in cervicogenic headache management.

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