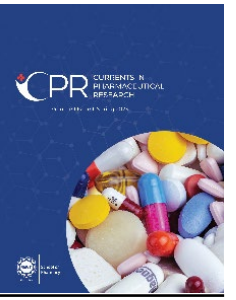
Currents in Pharmaceutical Research (CPR)
Volume 1 Issue 1, Spring 2023
ISSN$_{(P)}$: 3007-3235 ISSN$_{(E)}$: 3007-3243
Homepage: https://journals.umt.edu.pk/index.php/cpr

Article QR



Title:	**Comparative Analysis of the Impact of Positional Release Technique (PRT) and Ischemic Compression (IC) on Headache Disability and Pain in Cervicogenic Headache (CGH) Patients**
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DOI:	https://doi.org/10.32350/cpr.11.06
History:	Received: April 15, 2023, Revised: May 5, 2023, Accepted: May 23, 2023, Published: June 28, 2023
Citation:	Ahmad S, Umar M, Asim M, Khan Z, Iqbal AA. Comparative analysis of the impact of Positional Release Technique (PRT) and Ischemic Compression (IC) on headache disability and pain in Cervicogenic Headache (CGH) patients. *Curr Pharma Res*. 2023;1(1):85–98. https://doi.org/10.32350/cpr.11.06
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Conflict of Interest:	Author(s) declared no conflict of interest

A publication of
The School of Pharmacy
University of Management and Technology, Lahore, Pakistan

Comparative Analysis of the Impact of Positional Release Technique (PRT) and Ischemic Compression (IC) on Headache Disability and Pain in Cervicogenic Headache (CGH) Patients

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ABSTRACT

Headache originating from the bony structures or soft tissues of the neck is commonly known as cervicogenic headache. This study was conducted to determine the effects of the positional release technique (PRT) and ischemic compression (IC) on pain and headache disability among patients with cervicogenic headache (CGH). For this purpose, a randomized clinical trial was conducted. Data was collected from the Physiotherapy Department of Sharif Medical Complex, Lahore. A total of 36 CGH patients were assigned into two groups, randomly. The first group was treated with PRT and the other with IC. Both groups were given 12 sessions of therapy over a span of 4-weeks. HDI (Headache Disability Index) and NPRS (Numeric Pain Rating Scale) were used to measure the treatment effect on pain and headache disability before and after treatment. Among the participants (N = 36), the mean age of Group A and Group B was 26.22 ± 2.90 and 24.55 ± 2.55, respectively. A significant difference was found between the mean values of pre- and post-HDI and NPRS, with p-values 0.025 and 0.031, respectively and after treatment p value was 0.001 & 0.00 respectively. The results favoured the use of PRT because there was more variation in the mean values of PRT as compared to IC. Also, the mean values of pre- and post-HDI and NPRS scores varied significantly. Notably, a significant difference was not found between the mean values of both techniques at the beginning of treatment (pre-treatment). However, a significant difference was observed between the mean values of both techniques following treatment (post-treatment) in favour of PRT, since the mean values of PRT varied more than those of IC.

Keywords: cervicogenic headache (CGH), headache disability, ischemic compression (IC), pain, positional release technique (PRT)

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1. INTRODUCTION

Cervicogenic headache (CGH) originates in the soft tissues or bony structures located in the neck. It frequently follows a head or neck injury, although it can also happen without trauma. It can be challenging to differentiate between primary headaches, such as tension-type headaches and migraine, since the clinical characteristics of CGH might match with their symptoms. CGH affects between 0.4% to 2.5% of the world population. However, up to 20% of individuals with persistent headaches attend pain management clinics [1]. CGH is more common in women than men [2].

More than hundred distinct types of headaches have been identified and categorized in a logical, hierarchical framework by ICHD (International Classification of Headache Disorders). Moreover, all the above mentioned headache disorders have a precise diagnostic criteria. The categorization of ICHD is readily accepted and as compared to the criticism of other illness categorization systems, it has received relatively little criticism [3].

According to IHS (International Headache Society), there exists fourteen different headache classifications and subcategories. These categories include cluster headaches and migraine headaches. They are referred to as primary headaches since they originate in the vascular or muscle region, as compared to those with a secondary cause, such as inflammation or (head and neck) traumas, or those with a muscle origin (headaches of the tension variety) [4, 5]. On the other hand, CGH is caused by a musculoskeletal condition of the cervical spine. It develops from atlantooccipital and higher cervical joints [6]. Manual therapy is the most popular treatment for headaches, including secondary headaches, such as CGH. However, recent recommendations for treating CGH highlighted the absence of studies contrasting manual and exercise therapy with placebo or no-treatment controls. In view of the above, the current study aimed to evaluate the efficacy of various manual and exercise therapies in treating CGH, as compared to other treatments, sham treatments, and untreated controls [7].

Myofascial Trigger Point (MTrP) activity is one of the leading causes of CGH [8]. A perceptible tight belt of skeletal muscles contains stiff, localised zones of intense sensitivity called MTrPs [9]. MTrPs frequently

bring forth a painful muscle illness called myofascial pain syndrome. It is characterized by a painful region that becomes tender and painful upon compression, causes motor dysfunction, autonomic abnormalities and refer pain [10, 11]. Clinical characteristics of trigger sites indicate that they can be either active or latent [12]. Trigger points can also mimic spontaneous pain and can be linked to less apparent symptoms including weakness, paresthesia, and temperature changes. Muscle shortening indicates latent trigger sites and pain only manifests in response to pressure.

Many factors, such as bad posture, and muscular imbalance may trigger pain [13]. The standard symptoms for CGH include unilateral discomfort brought on by neck movement and continued uncomfortable posture. External pressure to the ipsilateral upper, posterior neck, or occipital area causes it. The pain from CGH is ipsilateral, non-radicular, and affect the cervical spine's range of motion. Non-clustering pain episodes, fluctuating or constant pain, moderate but not unbearable discomfort, typically not throbbing, and occasional nausea or vomiting may also be experienced [14].

According to recent review studies, physiotherapy may be helpful for pain management of individuals with various types of headaches, including CGH. PRT and IC are two treatment options for trigger points [8]. IC, which entails applying pressure on MTrP up to the maximum bearable level, is one of the proposed treatments widely employed in the therapy of MTrP. Substantial evidence has been accumulated to support the impact of ischemic compression on the treatment of MTrPs [15–18].

The above technique is one of the several methods that entail applying steady pressure to trigger sites long enough to stop the blood flow and release the tension in the muscle. Myofascial trigger points can be mechanically treated using ischemic compression, which involves applying steady pressure for an extended period to render the trigger points inactive. Travell and Simons labelled this technique as ischemic compression because the skin initially blanches and then displays reactive hyperemia upon pressure release [19–21].

2. MATERIALS AND METHODS

A single-blinded, randomized, controlled trial was conducted. Non-probability purposive sampling technique was used to gather data from the Physiotherapy Department of Sharif Medical Complex, Lahore. The study was finished in 9 months. With a sample size of 36 participants. To find out

if there was a significant difference between the two means, the online EPITOOL sample size calculator was used to determine the level of confidence (2-sided) as 1 - = 95%. The participants were randomly assigned into two groups (Group A and Group B) using an Excel sheet with a random number generator. The age range of patients included in the research was 18-30 years. The patients of both sexes had a single, neck-based ache that radiated to the frontotemporal area. Clinical characteristics included joint discomfort up to a certain point at one upper C0 – C3 (cervical spine), the worsening of the pain by neck movement, and a restricted motion of the normal cervical range. The symptoms also included a time span of more than three months of experiencing headaches (at least once on the weekends), a tangible taut hypersensitive band's presence, and a palpable or localized twitch upon snapping palpation. Patients with a history of a cervical spine infection, vestibular dysfunction, a vertebral tumor, fractures, brain or neck surgery, pain radiating to the upper side, extremities in the past, a cervical disc issue, or arthritis were excluded. If a participant had another primary headache (such as migraine or a tension headache), they were disqualified from the study. Every participant in this study provided written, informed consent. The therapist explained to the patients that the treated area should be exposed during the procedure, depending on the nature of the therapy. Before any intervention, the outcome assessor identified the patient's disorder, observed, and assessed pre- and post-treatment values, and calculated the patient's disorder score.

2.1. Group A (Conventional Treatment and PRT)

In addition to conventional care, PRT was administered to patients in Group A, which included three minutes of ultrasonic therapy for each muscle (SCM, upper trapezius). The intensity of the treatment varied depending on where the muscle was located, either superficial or deep (with 3MHz for superficial muscles). The sternocleidomastoid muscle was stimulated at 3MHz (1.0 watts/cm2), whereas the upper trapezius was stimulated at 3MHz (1.0 watts/cm2).

2.2. Group B (Conventional Treatment and Ischemic Compression)

The participants in Group B received ischemic compression in addition to conventional treatment, which included three minutes of ultrasonic therapy for the sternocleidomastoid and upper trapezius muscles. The intensity of treatment varied depending on whether the muscle was deep or

superficial (for deep muscles 3MHz at 1.o watts/cm2 and 3MHz at 1.0 watts/cm2). The intensity for sternocleidomastoid muscle was 3MHz at 1.0 watts/cm2. Finally, ischemic compression was applied to the most hypersensitive area of the muscular belly.

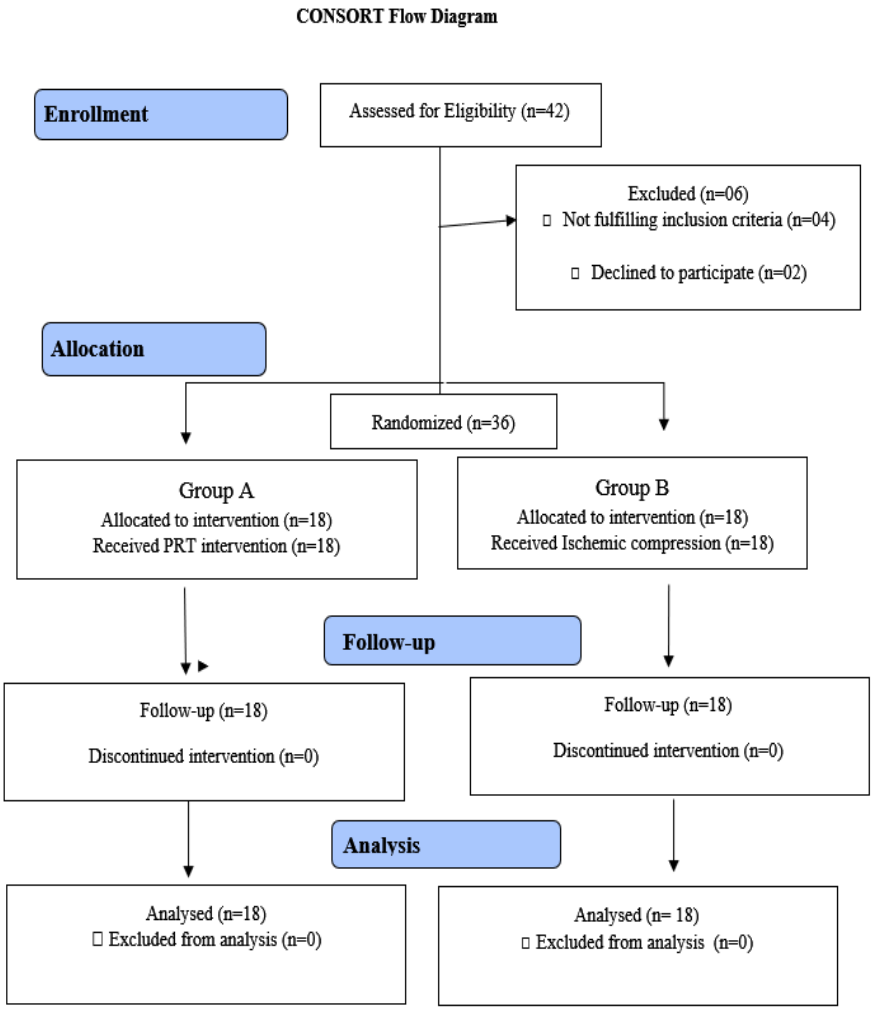

Figure 1. CONSORT Flow Diagram

2.3. Outcome Variable

2.3.1. Headache Disability Index (HDI). Headache Disability Index (HDI) is a scale. This scale is intended to help discover any problems caused

by headaches. There were 25 questions, each with three possible answers. yes will score 4 points sometimes will score 2 and no option will give 0 score. A total score of 10 - 28 is regarded as an indicator of light disability, the score of 30-48 represents moderate disability, 50-68 expresses severe disability, and 72 or above marks complete disability.

2.3.2. Numeric Pain Rating Scale (NPRS). Patients assessed their pain on an eleven-point numeric scale using the Numerical Pain Rating Scale (NPRS), a subjective measurement tool. The scale ranges from 0 (no pain at all) to 10 (the most incredible suffering conceivable) [22–24].

2.4. Data Analysis Procedure

Version 25 of SPSS for Windows was used to analyse the data. The cutoff value for statistical significance was $p = 0.05$. Statistically descriptive tests including bar charts and frequency tables were utilized to display an overview of the group measures taken over time. Intergroup differences were assessed using the parametric independent sample t-test. Individual pre- and post-treatment values within groups were calculated using the parametric paired sample t-test to compare group variables.

3. RESULTS

Among the selected 36 participants, 18 (50%) were men and 18 (50%) were women. The mean age for Group A was 26.22 ± 2.90 and the mean age for Group B was 24.55 ± 2.55, respectively. The mean BMI for Group A was 22.79 ± 1.76 and the mean BMI for Group B was 22.40 ± 1.38, respectively.

3.1. Paired Sample t-test

Table 1. Paired Sample Statistics of Pre- and Post- HDI and NPRS

		Mean	*N*	Standard Deviation	Standard Error Mean	*p* Value
Pair 1	Pre-HDI	37.9444	36	11.14858	2.62775	0.025
	Post-HDI	20.8333	36	9.06999	2.13782	
Pair 2	Pre-NPRS	6.5000	36	1.91741	.45194	0.031
	Post-NPRS	2.7778	36	1.86470	.43952	

The paired sample t-test was utilized to compare the mean values of measurements taken from the pre-/post-Headache Disability Index (HDI) and the National Pain Rating Scale (NPRS). The pre-HDI mean was 37.94

± 11.15, while the post-HDI mean was 20.83 ± 9.07. The *p*-value was 0.025, which indicated a significant difference between the mean values of pre-headache and post-headache HDI scores. Pre-NPRS mean was 6.5 ± 1.9, while post-NPRS mean was 2.8 ± 1.9. The *p*-value was 0.031, which indicated a significant difference between the mean values of pre- and post-NPRS scores.

3.2. Independent sample t-test

Table 2. Independent Sample t-test for Pre- and Post-HDI and NPRS

Groups		*N*	Mean	Standard Deviation	Standard Error Mean	*p* Value
Pre-HDI	Positional Release Technique	18	36.3333	11.58663	3.86221	0.556
	Ischemic Compression	18	39.5556	11.13678	3.71226	
Post-HDI	Positional Release Technique	18	12.2222	2.38630	.79543	0.001
	Ischemic Compression	18	24.4444	8.15646	2.71882	
Pre-NPRS	Positional Release Technique	18	6.5556	2.00693	.66898	0.907
	Ischemic Compression	18	6.4444	1.94365	.64788	
Pre-NPRS	Positional Release Technique	18	1.6667	1.00000	.33333	0.00
	Ischemic Compression	18	4.3333	1.32288	.44096	

Independent sample t-test was applied to compare the mean values of pre- and post-HDI and NPRS for the two techniques namely the positional release technique (PRT) and ischemic compression (IC). For the pre-HDI group, the mean value of PRT was 36.3 ± 11.6, while the mean value of IC was 39.55 ± 11.13. The *p*-value was 0.556, which indicated that there were no significant difference between the mean value of both techniques at baseline and in the post-HDI group. The mean value of PRT was 12.2 ± 2.9, while the mean value of IC was 24.44 ± 8.15. The *p*-value was 0.001, which indicated a non-significant difference between the mean values after treatment with respect to PRT. It might be because there was more variation in the mean values of PRT in comparison to the IC technique. In the pre-NPRS group, the mean value of PRT was 6.6 ± 2.01, while the mean value

of IC was 6.44 ± 1.94. The *p*-value was 0.907, which indicated that the results were not significant. A comparison between the mean values of both techniques at baseline and in the post-NPRS group was also performed. The mean value of PRT was 1.7 ± 4.3, while the mean value of IC was 4.3 ± 1.3. The *p*-value was 0.00, which suggested a significant difference between the mean values of both techniques after treatment related to PRT, due to the greater variation in the mean of PRT as compared to the IC technique.

4. DISCUSSION

The current study compared the effectiveness of PRT against IC. PRT was found to be more effective for cervicogenic headache (CGH) patients than the conventional treatment regime. Both restorative strategies, used alone as well as in conjunction with conventional treatment, positively affected headache frequency, intensity, pressure pain threshold, and headache disability. The baseline values for each person in this investigation were comparable. All the participants were within the age range of 18-30 years. The average age of the study's participants was 24.5 years. The age range was constrained in order to prevent the possibility of degenerative alterations [25]. People Below 50 Years of Age are mostly effected by Active myofascial trigger points. By the fourth week of treatment, HDI for Group A revealed a considerable improvement in headaches [26].

The results are in line with an earlier study by Wong and Schauer which observed that a strain/counter strain decreased the sensitivity to palpation in participants with painful spots in their hip musculature [27]. The PRT-treated group showed that the sensitivity of trigger points was reduced after the administration of the technique. These findings were consistent with Messenger et al. [28]. They observed that the PRT approach successfully lowered the discomfort level. This became evident by increasing the threshold for pressure pain related to major trigger sites in the upper trapezius muscle in participants with mechanical neck pain.

A study by Blanco et al. [29] compared the immediate effects of the application of strain/counter strain (SCS) technique and the muscle energy technique to improve active mouth opening after one session of treatment for the latent MTrPs in the masseter muscle. The study deduced the same conclusion. Within-group changes revealed a slight increase in active mouth opening after the application of SCS technique. A significant improvement

was observed in active mouth opening after the utilization of post-isometric relaxation technique. Lewis et al. [30] carried out a study to determine if an SCS intervention would result in an instant and long-lasting decrease in the soreness of the sensitive spots of low back pain patients. According to the results, SCS intervention did provide an immediate and measurable decrease in soreness at the MTrPs. However, some of this decrease could be attributed to the manual-contact part of the therapy. Moreover, Hutchinson assessed the effectiveness of the SCS technique among individuals with a history of an upper extremity recreational sports injury [31]. Their findings suggested that the SCS technique may be used to effectively treat tender points around the elbow in such individuals. By changing the nociceptor activity in soft tissues, PRT is believed to reduce tissue soreness. A rise in Pain Pressure Threshold (PPT) is equivalent to a fall in tissue sensitivity. Consequently, the measurement of the analgesic impact of PRT may be gauged by the rise in PPT in response to PRT.

According to past research and the current findings, PRT procedures may immediately relieve local pain and discomfort [32]. Kerry and George concluded that PRT treatment could successfully reduce joint hypomobility. The hypomobility of joints results from the muscles spanning the joints becoming hypertonic or tight. The afflicted muscles and fascial tissues relax when PRT is used. The initial phase of PRT therapy, known as the neuromuscular phase, reportedly lasts about ninety seconds for general orthopaedic patients and 3 minutes for neurologic patients in clinical studies. During this stage, PRT seemingly impacts incorrect proprioceptive activity, normalising tone and establishing the ideal length-tension relationship in the muscle. As a result, the affected muscle fibers elongate to their natural length, increasing the range of motion.

The primary objective of PRT is to reduce the pain by decreasing inflammation, reducing headache disability, and increasing physical functionality. In the current study, it was found that CGH patients, when treated with PRT and IC, experienced an improvement in pressure pain sensitivity, pressure pain threshold, and also gained enhanced physical functioning by decreasing the headache disability. Hence, PRT may be the best course of action for CGH patients. [32]

4.1. Conclusion

The mean values of the pre-/post-HDI and NPRS scores varied significantly. There was found no significant difference between the mean values of both techniques at the beginning of treatment (pre-treatment) for HDI and NPRS. However, there were a significant difference found between the mean values following treatment (post-treatment) for both HDI and NPRS for PRT, as its mean values varied more than the IC technique.

4.2. Limitations

- Long-term follow-up could not be done.
- The study consists of a small number of patients.

4.3. Recommendations

- Future research work is strongly recommended to evaluate the long-term effects of these observations by proceeding with follow-up sessions.
- Interventions should be applied to another group of muscles to examine if there is a favorable outcome.

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