



(RESEARCH ARTICLE)



## Determine the immediate effect on cervicogenic headache by primal reflex release technique (PRRT)<sup>TM</sup> on rectus capitis posterior muscle

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### Abstract

**Background/Purpose:** The present study aimed to determine the immediate effect on cervicogenic headache by primal reflex release technique (PRRT)<sup>TM</sup> on rectus capitis posterior muscle.

**Objective:** To determine the effects of primal reflex release techniques on the Rectus capitis posterior muscle in cervicogenic headache.

**Methodology:** 46 patients were examined according to the inclusion and exclusion criteria and randomly divided into experimental group and conventional group. Outcome measure including VAS, Cervical Rotation, NPDS, NDI and HDI were assessed prior to the intervention. Experimental group received primal reflex release technique which includes rectus capitis posterior muscle. Conventional treatment group received hot packs, stretching and cervical isometric. Post intervention assessment was done to assess immediate changes in subjects of both group for assessing immediate effects of treatment protocol.

**Result:** The study compares data from five outcome measures to assess the effectiveness of Primal Reflex Release Technique (PRRT) on cervicogenic headache. Results show that both PRRT and conventional therapy have similar effects on cervicogenic headache.

**Conclusions:** This study found positive changes in all outcome measures (VAS, cervical rotation, NPDS, HDI, and NDI) from pre- to post-intervention in both groups receiving either PRRT or conventional therapy for cervicogenic headache with rectus capitis posterior muscle involvement.

**Keywords:** Cervicogenic Headache; Rectus capitis posterior muscle; Primal Reflex Release Technique; Visual Analog Scale; Neck Pain and Disability Scale; Headache Disability Index; Neck Disability Index

### 1. Introduction

Headaches are a sign of various physical and anatomical issues, including cervical spine joint dysfunction, vascular illness, metabolic disorders, brain tumors, and trauma.<sup>[1]</sup> Headaches are a prevalent nervous system illness, affecting 48.9% of the general population. Primary headache disorders include cluster, tension-type, and migraine. Tension-type headaches affect 60-80% of people, while migraines affect 15%. Cluster headaches are rare, while cervicogenic headaches are secondary.<sup>[2]</sup> Cervicogenic Headache (CGH) is referred as head pain originating from cervical nerve-innervated musculoskeletal tissues, often linked to physical abnormalities in the cervical area, joints, muscles, and neural structures.<sup>[3]</sup> Cervicogenic headache, originating in the neck and spreading to the ipsilateral fronto-temporal and orbital areas, is a unilateral headache without side shift, but can also occur on both sides.<sup>[4]</sup> The International Headache

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Society (IHS) has established standards for diagnosing cervicogenic headaches (CGH), which can originate from cervical facet joints and is linked to restricted cervical muscular strength.<sup>[5]</sup> Cervicogenic headache is a head discomfort originating from the cervical spine, triggered by the confluence of afferents from the upper three cervical spinal neurons and trigeminal afferents, including structures like synovial joints, muscles, and vertebral arteries.<sup>[6]</sup> The International Study Group on Cervicogenic Headache (CGH) found that 75 % people met the criteria, with 51% men and 49% women.<sup>[7]</sup> The suboccipital triangle houses the rectus capitis posterior muscles, responsible for head and neck rotation and extension. The bilateral lack of these muscles can cause synchronization in the suboccipital area, while the extra muscle may increase pressure on the spine. Current fluctuations in these muscles are crucial in determining the cause of cervicogenic headaches, considering the potential impact on the axis spine. The suboccipital muscles are key for atlanto-axial and atlanto-occipital joint movement. The Rectus capitis posterior major and minor, innervated by the suboccipital nerve, primarily extend the head and contribute to rotation.<sup>[8]</sup> Innervated by the suboccipital nerve, the rectus capitis posterior major (RCPM) muscle primarily rotates and extends the head. While its main actions are rotation and extension, the RCPM may also contribute to some side bending and flexion at the atlanto-occipital joint. Studies suggest the RCPM enables up to 10 degrees of combined side bending, 25 degrees of combined flexion, and 10 degrees of total rotation.<sup>[9]</sup> Deep cervical muscles, including the RCP, OCS, and deep anterior and posterior muscles, are essential for maintaining head position, stability, and mobility in the neck, and are affected by cervical discomfort and cervicogenic headaches (CGH).<sup>[10]</sup> Cervicogenic headaches often require joint mobilisation, lifestyle education, manipulation, soft tissue mobilization, stretching techniques, and retraining of postural muscle groups. Cervical massages and cervical stabilisation exercises can help develop deep muscles and alleviate pressure headaches caused by upper cervical and upper thoracic spine manipulation.<sup>[11]</sup> The Primal Reflex Release Technique (PRRT) is a therapy paradigm in the regional interdependent approach to patient care, aiming to reduce pain patterns by suppressing the over stimulated autonomic nervous system. Regional interdependence suggests that a malfunction in one system can lead to discomfort or deficiency in another. Primal reflexes, such as withdrawal and startle responses, are body's protective defence mechanisms, controlling unlearned movement patterns. These responses, triggered by pain, can cause muscles to tense up, triggering fight, flight, or freeze responses. Despite various therapies, no research has been conducted on PRRT (primal reflex release technique) for treating RCPM in cases with cervicogenic headache.<sup>[12]</sup>

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## 2. Materials and methods

Need of the study: Cervicogenic headache is very common in general population and various researches has done on several intervention to treat CGH but there has been no such study on PRRT™ technique and thus it's become important to check the effectiveness of PRRT™ technique on Cervicogenic headache.

### 2.1. Study design

This study was a Comparative Study.

### 2.2. Study population

All subjects both Female and Male include from Himalayan hospital Physiotherapy OPD.

### 2.3. Sampling

A random sampling method was performed to select the patient for the individual groups.

### 2.4. Sample size

46 subjects were selected according to the inclusion and exclusion criteria.

#### 2.4.1. Inclusion criteria <sup>[9]</sup>

The study included age 18-55 years, male and female both gender, Neck pain with trigger point (NPRS – VAS- 4-5), Unilateral pain in neck and occipital region, Restriction and reduce range of motion. (25°-28°), multiple episodes of cervicogenic headache.

#### 2.4.2. Exclusion criteria <sup>[9]</sup>

Patients with surgery on cervical area, photophobia (eyes discomfort in bright light), phonophobia (unwarranted fear of sound), vertigo and dizziness with headache.

Outcome measures: VAS, Cervical Flexion-Rotation Test, Neck Disability Index, Headache Disability Index, Neck Pain Disability Scale

### 2.4.3. Procedure

Subjects were selected based on the inclusion and exclusion criteria. After signing the consent form, subjects were randomly divided into 2 groups, i.e. Group A (Experimental group) and Group B (Control Group).

Pre- intervention assessment was done. Cervical tightening and stiffness was assessed by cervical rotation test and palpates Rectus capitis posterior muscle for fluffiness. And other assessment was done with the help of outcome measure

Group A received PRRT for RCPM on cervicogenic headache.

Patient will be in supine position. Therapist sits behind the patient's head and palpates Rectus capitis posterior muscle for fluffiness and range of motion.

If the fluffiness is present in RCPM, then the Therapist will ask the patient to relax head & neck on therapist hand. The therapist will apply deep pressure over the involved site, the upward pressure will be applied to the muscle until the therapist feel pulsation over the involved site, repeat the procedure for 3 sets and recheck for fluffiness and rest for 5 min. In Second procedure, therapist keep one hand behind the patient head and through other hand the therapist will apply downward pressure over the patient's forehead and will ask the patient to move eye ball in foot direction, repeat the procedure for 3 sets and recheck for fluffiness.

Group B received conventional therapy for RCPM on cervicogenic headache. Post- intervention assessment was done for both group.

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## 3. Result

This chapter presents the results of data analysis for five outcome measures: VAS (Visual Analog Scale), Cervical Rotation test, Neck Pain and Disability Scale, Headache Disability Index, and Neck Disability Index. The analysis compares scores between group and within each group (A and B) to assess the effectiveness of Postural Restoration Rotational Therapy (PRRT) on cervicogenic headache.

Evaluation of VAS scores revealed significant pain reduction in participants from both groups. Interestingly, Group A exhibited a trend towards a greater decrease in pain compared to Group B.

Evaluation of VAS scores post-intervention showed a significant difference, with Group A experiencing a slightly greater improvement compared to Group B. These results suggest that PRRT may be more effective in reducing pain associated with cervicogenic headache.

Analysis of the Cervical Rotation Test revealed significant improvements in cervical spine mobility for participants in both Group A and Group B. However, the increase in range of motion was slightly greater in Group A compared to Group B.

Post-intervention analysis of the Cervical Rotation Test revealed significant improvements in both groups. Group A (mean: 83.26, SEM:  $\pm 0.974$ ) demonstrated a slightly greater increase in range of motion compared to Group B (mean: 72.96, SEM:  $\pm 1.412$ ). These findings suggest that PRRT may be more effective in improving cervical spine mobility in patients with cervicogenic headache.

Analysis of Neck Pain and Disability Scale (NPDS) scores revealed significant improvements in both Group A and Group B. While the decrease in disability was statistically significant, Group A showed a trend towards a slightly greater reduction compared to Group B.

The analysis of Neck Pain and Disability Scale (NPDS) scores revealed significant improvements for participants in both Group A and Group B. However, the reduction in disability was slightly greater in Group A (mean: 28.48) compared to Group B (mean: 35.13). While these findings suggest a potential benefit of PRRT in alleviating neck pain and disability associated with cervicogenic headache, it's important to consider the magnitude of the difference between groups.

Evaluation of Neck Disability Index (NDI) scores revealed a significant difference between groups. Group A achieved a slightly greater improvement in functional limitations compared to Group B, although both groups showed improvement.

Post-intervention Neck Disability Index (NDI) scores showed a significant difference between groups. Group A (mean: 24.91) achieved a slightly greater improvement in disability compared to Group B (mean: 32.30). These results suggest that PRRT may be more effective in reducing functional limitations associated with cervicogenic headache.

Analysis of the Headache Disability Index (HDI) revealed significant improvement in both Group A and Group B, with a trend towards a greater reduction in headache-related disability in Group A.

Post-intervention analysis of the Headache Disability Index (HDI) revealed a significant difference between groups. Group A (mean: 31.61, SEM: ±0.705) demonstrated a slightly greater reduction in headache-related disability compared to Group B (mean: 38.48, SEM: ±0.762). These findings suggest that PRRT may be more effective in alleviating the functional limitations associated with cervicogenic headache.

Post-intervention comparisons revealed a statistically significant difference between groups (p-value = 0.001). However, further analysis is needed to determine the specific nature of this difference. While both PRRT and conventional therapy may have shown effects on cervicogenic headache, but PRRT showed a slightly more significant effect compared to conventional, but the effect was not enough to conclude PRRT to be more effective. Therefore it can be concluded that both have almost same effect.

**Table 1** Within group comparison of Outcome Measure in Group A (MEAN ± SD)

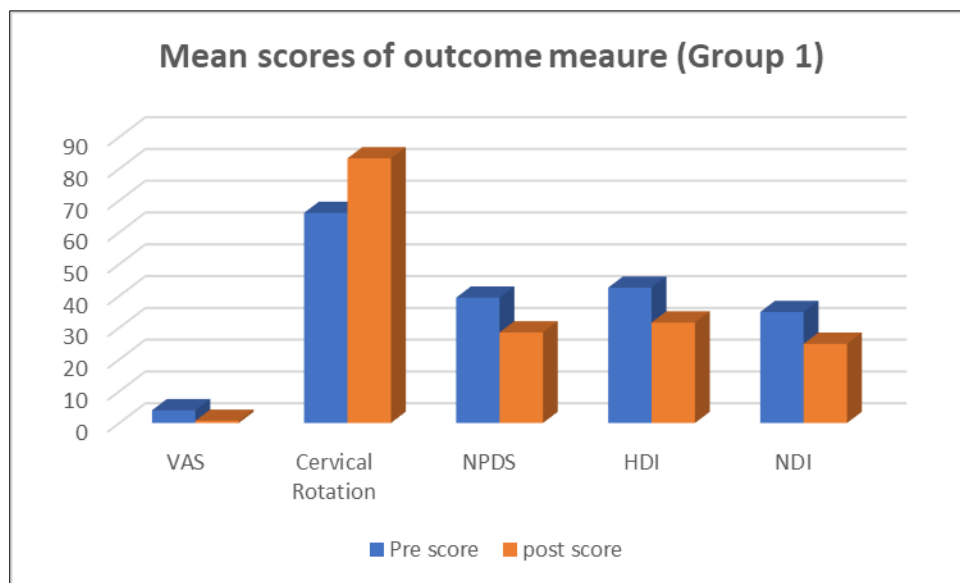
S. NO	Outcome Measure	Pre Mean ± SD (median)	Post Mean ± SD (median)
1.	VAS	4.00± 0.674(4.00)	0.70± 0.635(1.00)
2.	Cervical Rotation	66.09 ±7.223(65.00)	83.26 ±4.673(84.00)
3.	NPDS	39.43±6.081(38.00)	28.48± 5.434(29.00)
4.	HDI	42.57±4.430(41.00)	31.61±3.381(32.00)
5.	NDI	34.91± 2.392(34.00)	24.91± 2.678(24.00)

**Table 2** Within group comparison of Outcome Measure in Group B (MEAN ± SD)

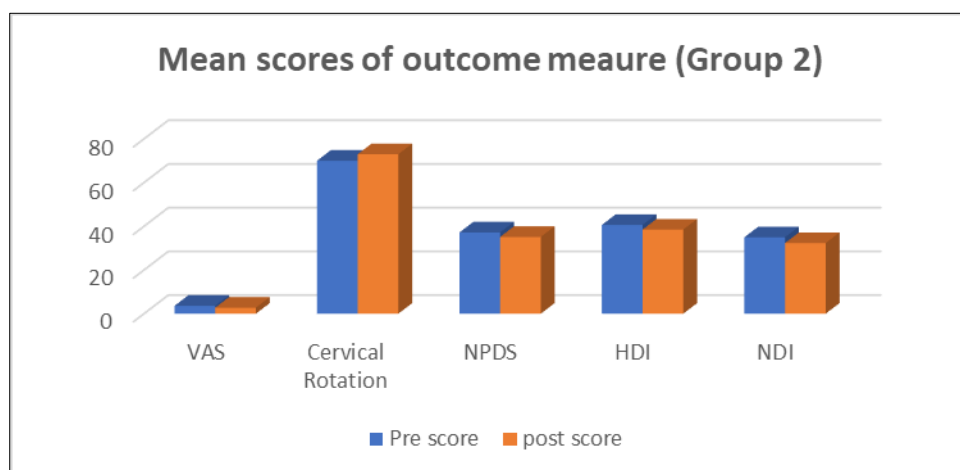
S. NO	Outcome Measure	PreMean ± SD(median)	PostMean± SD(median)
1.	VAS	3.61± 0.839 (4.00)	2.74± 0.864 (3.00)
2.	Cervical Rotation	70.00± 7.385 (70.00)	72.96± 6.772 (75.00)
3.	NPDS	37.17± 2.480 (37.00)	35.13± 3.279 (35.00)
4.	HDI	40.61±3.434 (40.00)	38.48±3.654 (38.00)
5.	NDI	34.96±2.637 (34.00)	32.30±3.661 (30.00)

**Table3** P-value of in between Group Comparison of Post data of Outcome Measure

Outcome Measure (Post Group A-Post Group B)	P-Value
VAS	0.000
Cervical Rotation	0.000
NPDS	0.000
HDI	0.000
NDI	0.000



**Figure 1** Mean scores of outcome measure (Group 1)



**Figure 2** Mean scores of outcome measure (Group 2)

#### 4. Discussion

The purpose of the study was 46 patients were examined according to the inclusion and exclusion criteria and randomly divided into experimental group and conventional group. Outcome measure including VAS, Cervical Rotation, NPDS, NDI and HDI were assessed prior to the intervention. Experimental group received primal reflex release technique which includes rectus capitis posterior muscle. Conventional treatment group received hot packs, stretching and cervical isometric. Post intervention assessment was done to assess immediate changes in subjects of both group for assessing immediate effects of treatment protocol.

The PRRT down regulation approach is typically used to treat pain, muscle tightness, spasm, and hyperactive nerves that are thought to be associated to the "up-regulation" of primal reflexes, according to Erika K. Vichales<sup>[16]</sup> explanation of the PRRT's mechanism of action. The central sensitisation may happen first or concurrently with the "up-regulated" neuronal reflexes.

In case of Cervicogenic headache the subject suffers most from pain, stiffness, range of motion, tenderness, quality of life and due to this they have different forming in daily activity. The most remarked benefit which subject with get form

this intervention is that there will be able to perform daily activity without pain and stiffness as because in performing simple daily activity, headache, stiffness & tenderness can become very depressing if it persists for long term.

Nikolai Bogduk,<sup>[17]</sup> chews over the pathophysiology of cervicogenic headache which is due to the convergence of afferents from the upper three cervical spinal neurons and trigeminal afferents. The structures that the C1 to C3 spinal nerves innervate include the upper cervical muscles, dura mater of the upper spinal cord and posterior cranial fossa, the vertebral and internal carotid arteries, and the upper cervical synovial joints. These structures are the potential causes of cervicogenic headaches. Headaches might originate from the cervical muscles and joints, according to studies conducted on healthy individuals.

In this study 5 outcome measures were used, let us discuss them one by one.

The VAS indicated that the participant was responding favourably to the first outcome measure. Although both A and B exhibit improved results, group A demonstrated a slight significant difference in result based on pre and post data. This outcome measure is typically used to monitor pain in patients. Post-mortem evidence, however, indicates that conventional treatment and PRRT are equally effective interventions for cervicogenic headache. Pressure biofeedback-guided DCFM strength training significantly reduced pain intensity (VAS) during week two and three in comparison to manual treatment. According to Shahnaz Hasan's et al.<sup>[18]</sup> findings, the Patients with CGH experienced less functional impairments due to headaches after receiving either medication.

The cervical rotation test was the second outcome measure, and the individual performed well on it, according to the outcome measure. This outcome metric is typically used to assess a patient's range of motion. As a consequence, we can state that both A and B exhibit superior results, however, group A's results differed significantly between pre- and post-data. Nevertheless, post- and post-data made it evident that both interventions were equally effective in treating cervicogenic headaches.

According to the outcome measure, the third one was NPDS, and the individual had good response. Typically, patients' neck discomfort and impairment are assessed using this outcome measure. In light of this, we may state that group A demonstrated a marginally significant outcome based on pre- and post-data, whereas group B had a better result overall. But it soon became evident from the post- and post-data that both interventions- i.e. PRRT and conventional therapy, were excellent in treating cervicogenic headaches.

According to the outcome measure, the patient responded favourably to the fourth outcome measure, which was NDI. Typically, neck impairment in patients is assessed using this outcome measure. In light of this, we may state that group A demonstrated a marginally significant outcome based on pre- and post-data, whereas group B had a better result overall. But it soon became evident from the post- and post-data that both interventions were effective in treating cervicogenic headaches.

The individual responded favourably to the fifth outcome measure, which was HDI. This outcome measure is typically employed to assess patient's headache. In light of this, we may state that while both A and B exhibit superior results, group A's performance differed somewhat and significantly between pre- and post-data. Nevertheless, post- and post-data made it evident that both interventions were superior in treating cervicogenic headaches.

The conclusion reached by Paul Posadzki et al.<sup>[19]</sup> that SM (Spinal Manipulation) is beneficial for CGH is inconclusive. Even though there are clear data, SM cannot be considered an evidence-based therapy for CGH. In order to treat cervicogenic headaches and improve pain, stiffness, trigger points, range of motion, and quality of life, the current study concentrated on the immediate effects of PRRT. In their case series, Bethany L. Hansberger et al.<sup>[12]</sup> came to the conclusion that PRRT helps patients with plantar fasciitis feel less apprehension. Additionally, Valerie F. Stevenson et al.<sup>[20]</sup> demonstrated that individuals continued to be functionally pain-free after two weeks and that there is a considerable reduction in pain just after the PRRT session.

Future Research on this study should be performed on larger population with higher VAS values. The same study can be done with comparing PRRT versus other intervention techniques. Long term effect of PRRT can be analyzed. In Limitation, the number of sample size was less. Long term effect was not analyzed.

### *Abbreviations*

- ANS: Autonomic Nervous System,
- PRRT: Primal Reflex Release Technique,

- VAS: Visual Analog Scale,
- NPDS: Neck Pain Disability Scale,
- NDI: Neck Disability Index, HDI: Headache Disability Index, SD: Standard Deviation,
- SEM: Standard Error Mean

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## 5. Conclusion

This study found positive changes in all outcome measures (VAS, cervical rotation, NPDS, HDI, and NDI) from pre- to post-intervention in both groups receiving either PRRT or conventional therapy for cervicogenic headache with rectus capitis posterior muscle involvement. While comparing mean values of post- post data of both group experimental and control group, there was no difference according to p-value for outcome measure VAS, CERVICAL ROTATION, NPDS, HDI& NDI which means that subjects of both groups reported positive changes for outcome measure VAS, CERVICAL ROTATION, NPDS, HDI& NDI. Thus, it is better to consider that both PRRT™ and conventional exercise helps in reducing cervicogenic headache.

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## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all Individuals participants included in the study.

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