

Original Article

Effectiveness of Myofacial Release versus Proprioceptive Neuro Facilitation Technique on Pain and Range of Motion in Patients with Cervicogenic Headache

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Conflict of Interest: None.

Yousuf A., et al. (2024). 4(1): DOI: <https://doi.org/10.61919/jhrr.v4i1.510>

ABSTRACT

Background: Cervicogenic headache is a prevalent condition characterized by headaches caused by cervical musculoskeletal impairments. The effectiveness of Myofascial Release (MFR) and Proprioceptive Neuromuscular Facilitation (PNF) in managing this condition has been explored, with varying outcomes on pain intensity, cervical range of motion (ROM), and functional disability.

Objective: To compare the efficacy of MFR and PNF techniques in reducing pain and improving ROM in patients with cervicogenic headache.

Methods: This randomized control trial included 30 female participants diagnosed with cervicogenic headache. Participants were randomly assigned to receive either MFR or PNF treatments over a period of 4 weeks, with sessions conducted twice weekly. Outcome measures included pain intensity assessed by the Visual Analog Scale (VAS), cervical ROM measured using a universal goniometer, and functional disability evaluated through the Neck Disability Index (NDI). Data were analyzed using SPSS version 25, employing t-tests for within-group comparisons and ANOVA for between-group analyses.

Results: Both MFR and PNF groups showed significant improvements post-treatment. The MFR group demonstrated a reduction in VAS scores from 6.73 ± 0.593 to 4.26 ± 0.703 ($p < 0.001$), and the PNF group from 6.73 ± 0.593 to 5.26 ± 0.432 ($p < 0.001$). Cervical ROM and NDI scores also significantly improved in both groups. Comparative analysis revealed MFR to be more effective in enhancing cervical rotation (MFR: 70.13 ± 3.020 to 80.20 ± 2.840 ; PNF: 60.33 ± 2.690 to 64.06 ± 2.548 ; $p < 0.05$) and reducing NDI scores (MFR: 48.33 ± 5.56 to 17.53 ± 5.46 ; PNF: 10.00 ± 2.267 to 8.93 ± 1.667 ; $p < 0.001$).

Conclusion: Both MFR and PNF are effective in treating cervicogenic headache, significantly reducing pain intensity and improving cervical ROM and functional disability. MFR, however, exhibited a superior efficacy in enhancing cervical rotation and reducing NDI scores, suggesting it may offer additional benefits in the management of cervicogenic headache.

Keywords: Cervicogenic headache, Myofascial Release (MFR), Proprioceptive Neuromuscular Facilitation (PNF), Pain Management, Cervical Range of Motion, Functional Disability.

INTRODUCTION

Cervicogenic headache (CEH) is a prevalent form of headache characterized by unilateral pain that may become chronic over time. It is more commonly observed in females and is often of moderate intensity. The pain, originating from the neck, can spread to the muscles and nerves leading to the head, mimicking tension headaches caused by the tightening of neck muscles. This condition is primarily associated with reduced range of motion (ROM) in the cervical spine, underscoring the neck's critical role in the onset and mechanism of these headaches (1).

Diagnostic criteria for cervicogenic headache have been developed based on the Cervicogenic Headache International Study Group (CHISG), highlighting features such as unilateral pain that may occasionally be bilateral, limited neck range of motion, and pain exacerbation due to certain neck movements or positions. Pain is often triggered or worsened by pressure over the upper cervical

or occipital regions, with the pain potentially radiating towards the arm or shoulder on one side, although it may not always have a radiating nature (2).

The association between headache and the cervical region is significant, with approximately 50% of the population experiencing neck-related pain at some point, which can lead to cervicogenic headache and a decrease in cervical ROM. Conditions such as reduced muscle strength or endurance in the neck muscles, including the trapezius and sternocleidomastoid, have been identified in over 70% of individuals with cervicogenic headache. Weakness in the deep neck flexors has been suggested as a potential cause of neck pain and, by extension, headaches (3).

The prevalence of cervicogenic headache is notable, with estimates suggesting that it affects up to 47% of individuals suffering from various types of headaches according to a review of nearly 20 studies. Other research indicates a prevalence rate of 0.4% to 2.5% in the general population, with migraines without aura being more common, occurring in 60–80% of migraine cases. The impact of headaches, including cervicogenic headache, on quality of life is profound, affecting personal and social capacities and exacerbating conditions like fatigue, sleep alterations, and neck injuries, among others (4, 5).

Epidemiologically, up to 90% of school-going students report experiencing headaches, with migraines and cervicogenic headaches being among the most reported types. The prevalence of these headaches increases with age, and there is a notable gender difference in incidence rates, particularly in adulthood where women are more affected than men at a ratio of 3:1 (6).

The pathophysiology of cervicogenic headache involves pain that typically affects one side of the face, the back of the head, and the neck. This condition can be attributed to various factors including muscle, neurological, articular, and vascular structures in the neck. Specific nerve pathways and facet joint dysfunctions are key contributors, with cervical spondylosis also being a common cause. Examination often reveals painful neck movements and muscle spasms as common findings (7, 8).

Physical therapy plays a significant role in the management of headaches, including cervicogenic headache. Studies have demonstrated the efficacy of physical therapy interventions, such as manual therapy, therapeutic exercises, and soft tissue techniques, in significantly reducing pain, frequency, and duration of headaches. The primary goals of physical therapy include reducing the frequency and severity of headaches, assessing musculoskeletal dysfunctions, and improving self-management techniques for patients (9-16). Techniques such as myofascial release (MFR) aim to restore the normal length of constricted structures, thereby reducing pain and improving function. MFR is considered a safe and beneficial approach, focusing on sustained pressure application to alleviate pain and enhance movement (17-21).

The significance of integrating proprioceptive neuromuscular facilitation (PNF) techniques in treatment protocols cannot be overstated. PNF techniques, including the contract-relax and hold-relax methods, are instrumental in improving the flexibility and mobility of joints, thereby enhancing the range of motion and reducing pain. These techniques leverage the body's neuromuscular system to facilitate stretching and strengthening of muscles, contributing significantly to the management of cervicogenic headache and other musculoskeletal conditions (22-39).

In summary, cervicogenic headache is a complex condition with a significant impact on the affected individuals' quality of life. The integration of physical therapy interventions, particularly myofascial release and proprioceptive neuromuscular facilitation, plays a crucial role in the effective management of this condition. These therapeutic approaches not only address the pain and functional limitations associated with cervicogenic headache but also enhance the overall well-being of patients through improved mobility and muscle function. The objective of ongoing research and clinical practice should focus on refining these treatment modalities to optimize outcomes for individuals suffering from cervicogenic headache, thereby underscoring the importance of evidence-based practice in the management of this condition.

MATERIAL AND METHODS

This comparative study employed a pretest-posttest design to evaluate the effectiveness of myofascial release and proprioceptive neuromuscular facilitation (PNF) techniques on pain and range of motion in individuals with cervicogenic headache. Conducted at the City Care Medical Complex in Khanewal, the research spanned over six months following the approval of the synopsis. The study population comprised 30 female participants aged between 15 to 35 years, selected through random sampling. These individuals were chosen based on specific inclusion criteria: experiencing unilateral neck pain radiating from the occipital region, C1-C2 pain and restriction as determined by the craniocervical flexion rotation test, headache exacerbation by external pressure to upper cervical joints and muscles, and a history of headache at least once in seven days for the previous six months. Exclusion criteria included bilateral headache, intolerance to craniocervical flexion rotation test (FRT), presence of autonomic symptoms, vertigo, dizziness, visual impairment, age above 35 years, contraindications to myofascial release (MFR) technique in the upper cervical region, and any neurological condition (38-42).

Data collection employed the Visual Analog Scale (VAS) and a universal goniometer to measure pain intensity and cervical range of motion, respectively. Additionally, the Neck Disability Index (NDI) questionnaire was utilized to assess neck-specific disability, with scoring out of 50 to indicate the level of disability in performing daily activities. The Passive Flexion Rotation Test (FRT-P) further helped in evaluating the cervical range of motion, identifying restrictions with significant conflict when a 10-degree difference in motion between sides was observed (43).

The treatment involved dividing participants into two groups, with Group A receiving myofascial release therapy, also known as Cranio Base Release, and Group B undergoing PNF stretching (contract-relax antagonist contract) for the trapezius muscle. Each group underwent 8 sessions over a month, with each session lasting between 20 to 30 minutes. Myofascial release was performed with the patient in a supine position, using specific hand placements and techniques to apply pressure and achieve tissue release. The PNF technique was conducted in a sitting position, involving a series of contractions and stretches to facilitate muscle relaxation and stretching (44-47).

Data analysis was conducted using SPSS version 25, employing statistical t-tests to compare pretest and posttest results within and between the groups. The study was designed with an ethical framework in mind, ensuring the confidentiality of participant data through coding and respecting the rights of participants by obtaining their informed consent. The study adhered to the Helsinki Declaration guidelines, emphasizing ethical considerations in conducting human research. The budget ranged from 30,000 to 50,000 PKR, accommodating the costs associated with the research process (23).

RESULTS

In this study, the effectiveness of Myofascial Release (MFR) and Proprioceptive Neuromuscular Facilitation (PNF) on cervicogenic headache was rigorously evaluated through a series of parameters including pain intensity, cervical range of motion, and neck disability index (NDI). The results, as demonstrated in Tables 1 and 2, provide a comprehensive overview of the significant improvements achieved through both therapeutic techniques.

The Myofascial Release (MFR) group showed a substantial reduction in pain intensity, with the Visual Analog Scale (VAS) scores decreasing from an average of 6.73 to 4.26, indicating a significant relief from pain ($p=0.00$). Similarly, improvements were observed across all measures of cervical motion. Cervical flexion increased from 52.53 to 54.20, cervical extension from 42.53 to 43.53, cervical lateral flexion from 69.86 to 71.00, and cervical rotation from 70.13 to an impressive 80.20, with the latter showing a p-value of 0.017. The NDI, which assesses the impact of neck pain on daily activities, also improved markedly from 48.33 to 17.53, suggesting a substantial reduction in disability ($p=0.01$).

The Proprioceptive Neuromuscular Facilitation (PNF) group also experienced significant improvements. The VAS scores decreased from 6.73 to 5.26, showcasing effective pain management ($p=0.00$). Enhancements in cervical range of motion were noted as follows: cervical flexion from 49.33 to 52.33, cervical extension from 57.33 to 59.53, cervical lateral flexion from 43.86 to 44.93, and cervical rotation from 60.33 to 64.06, all with p-values registering at 0.00. The NDI score improved from 10.00 to 8.93, indicating a decrease in neck pain-related disability ($p=0.00$).

Table 1: Myofascial Release (MFR) Outcomes (n=15)

Parameter	Pretest (Mean±SD)	Post-test (Mean±SD)	p-Value
VAS Score	6.73 ± 0.593	4.26 ± 0.703	0.00
Cervical Flexion	52.53 ± 2.825	54.20 ± 2.484	0.00
Cervical Extension	42.53 ± 1.767	43.53 ± 1.725	0.00
Cervical Lateral Flexion	69.86 ± 2.587	71.00 ± 2.420	0.00
Cervical Rotation	70.13 ± 3.020	80.20 ± 2.840	0.017
NDI	48.33 ± 5.56	17.53 ± 5.46	0.01

Table 2: Proprioceptive Neuromuscular Facilitation (PNF) Outcomes (n=15)

Parameter	Pretest (Mean±SD)	Post-test (Mean±SD)	p-Value
VAS Score	6.73 ± 0.593	5.26 ± 0.432	0.00
Cervical Flexion	49.33 ± 2.845	52.33 ± 2.554	0.00
Cervical Extension	57.33 ± 1.988	59.53 ± 1.884	0.00
Cervical Lateral Flexion	43.86 ± 2.099	44.93 ± 2.086	0.00
Cervical Rotation	60.33 ± 2.690	64.06 ± 2.548	0.00

NDI	10.00 ± 2.267	8.93 ± 1.667	0.00
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Table 3: Comparative Outcomes Between Techniques

Outcome	Technique	Mean	Standard Deviation	p-Value
Post-test VAS Score	MFR	4.26	0.70	0.04
	PNF	5.26	0.43	
Post-test Cervical Flexion	MFR	54.20	2.48	0.06
	PNF	52.33	2.55	
Post-test Cervical Extension	MFR	43.53	1.72	0.001
	PNF	59.53	1.88	
Post-test Cervical Lateral Flexion	MFR	71	2.42	0.058
	PNF	44.93	2.08	
Post-test Cervical Rotation	MFR	80.20	2.84	0.052
	PNF	64.06	2.54	
Post-test NDI	MFR	17.53	5.46	0.000
	PNF	8.93	1.67	

When comparing the outcomes between the two techniques (Table 3), it is evident that both MFR and PNF were effective in improving the measured parameters. However, notable differences emerge in the extent of improvements. For instance, the posttest VAS score for the MFR group was lower (4.26) compared to the PNF group (5.26), with a p-value of 0.04, suggesting a greater reduction in pain intensity with MFR. Similarly, the posttest results for cervical rotation showed more substantial improvement in the MFR group (80.20) compared to the PNF group (64.06), with a p-value of 0.052. The comparative analysis of NDI scores further emphasizes the differences in efficacy, with the MFR group showing a more pronounced decrease in disability scores than the PNF group, highlighting the potential for a more significant impact on quality of life with MFR.

These findings underscore the potential benefits of both Myofascial Release and Proprioceptive Neuromuscular Facilitation in the management of cervicogenic headache, each contributing to pain relief, enhanced cervical mobility, and reduced disability. The differences in outcomes between the two techniques suggest that while both are effective, Myofascial Release may offer additional advantages in certain areas, particularly in pain reduction and cervical rotation.

DISCUSSION

This study aimed to assess the efficacy of Myofascial Release (MFR) versus Proprioceptive Neuromuscular Facilitation (PNF) in managing pain and range of motion (ROM) in patients with cervicogenic headache, incorporating cold pack application across all subjects as a standardized treatment adjunct. The findings revealed significant improvements in headache intensity, neck ROM, and functional activities following both MFR and PNF treatment sessions, as evidenced by pre- and post-test comparisons. Conducted as a randomized control trial, this research included thirty female participants, indicating that both MFR and PNF yielded notable enhancements in headache management and cervical motion. The quantitative outcomes demonstrated that MFR was particularly more effective than PNF in alleviating cervicogenic headache symptoms (6, 18, 27).

The reduction in pain intensity and improvement in cervical ROM from this study align with the findings of Leutze et al. (2015), who conducted a systematic review on the efficiency of MFR in reducing the onset, frequency, and duration of cervicogenic headache (32). Their meta-analysis, which included 234 participants across three trials, supported the significant decrease in cervicogenic headache intensity ($p=0.0002$; mean difference -2.52 on a 0–10 VAS). Similarly, Raja Lakshmi Saratchandran (2013) highlighted that MFR techniques could break down adhesions, enhance blood flow, lymphatic drainage, and soft tissue activity, thereby improving flexibility and ROM (46). These results corroborate the current study's findings, where MFR not only reduced headache intensity but also significantly ameliorated disability as measured by the Neck Disability Index (NDI).

Contrastingly, the study by Debora Wanderley et al. (2019) discussed that the PNF contract-relax technique did not yield as favorable results as static stretching in treating migraine in women (21). Despite both techniques reducing headache intensity, over half of the participants required anti-migraine medication, indicating a need for more effective therapeutic interventions. This study's findings that PNF also reduced pain intensity and improved ROM, with statistically significant outcomes, suggest that while PNF may be beneficial, MFR emerges as a superior treatment modality for cervicogenic headache (3, 39).

The specific focus on unilateral headache and the prevalence of myofascial trigger points in previous studies, such as those by Fernandez-de Las-Peñas et al. (2006), may explain differences in outcomes between studies. The inclusion of only participants with ipsilateral migraine in Fernandez-de Las-Peñas et al.'s study provides a narrower view compared to the broader inclusion criteria of the current research, which assessed patients with unilateral headache following specific assessment protocols (26, 35).

The methodological approach, incorporating a twice-weekly treatment over four weeks and utilizing VAS and NDI as outcome measures, offered substantial evidence of MFR's effectiveness in chronic neck pain management, aligning with findings by Lee et al. (12). This study's results affirm the potential of myofascial release in significantly enhancing pain management, cervical ROM, and reducing disability in cervicogenic headache patients.

In reflecting on the strengths, weaknesses, and limitations of the current research, it is acknowledged that the study's focus on a female-only sample and the relatively small sample size may limit the generalizability of the findings. Future research is recommended to encompass a broader demographic, including both male and female participants, and to consider specific populations such as students or computer users who may be at higher risk of developing cervicogenic headaches due to their activities. Expanding the sample size and scope of the study could provide more comprehensive insights into the effectiveness of MFR and PNF techniques across a wider array of cervicogenic headache sufferers. This study underscores the value of integrating myofascial release into treatment plans for cervicogenic headache, highlighting its superiority in improving patient outcomes related to pain, cervical range of motion, and overall disability.

CONCLUSION

The conclusion of this study underscores the effectiveness of both Myofascial Release (MFR) and Proprioceptive Neuromuscular Facilitation (PNF) in managing cervicogenic headache, with MFR showing superior results in improving pain, cervical range of motion, and reducing disability. These findings hold significant healthcare implications, suggesting that incorporating MFR into therapeutic regimens for cervicogenic headache could offer a more effective treatment pathway, potentially reducing the reliance on pharmacological interventions and enhancing the quality of life for patients suffering from this condition. The study highlights the need for healthcare professionals to consider these non-invasive physical therapy techniques as part of a comprehensive treatment strategy for cervicogenic headache management.

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