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Effectiveness of Cervicogenic Myofascial Release Combined with TENS in Managing Tension-Type Headache: A Quasi-Experimental Study

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KEYWORDS

Cervicogenic Headache, Myofascial Release, Transcutaneous Electric Nerve Stimulation, Pain Measurement, Visual Analog Scale, Musculoskeletal Manipulations, Neck Pain, Physical Therapy Modalities

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ABSTRACT

Introduction: Tension-Type Headache (TTH) is one of the most common types of headache, typically presenting as a dull, aching, band-like pain around the head and neck, often linked with myofascial dysfunction and psychological stress. Non-pharmacological interventions such as Cervicogenic Myofascial Release (CMR) and Transcutaneous Electrical Nerve Stimulation (TENS) have shown promising outcomes in symptom alleviation.

Objective: To assess the efficacy of combining Cervicogenic Myofascial Release with TENS in reducing headache severity, frequency, and neck-related disability among individuals with TTH.

Methods: A quasi-experimental study was conducted with 50 participants diagnosed with TTH who underwent combined CMR and TENS therapy for 6 weeks. Outcome measures—VAS, headache frequency, and NPQ—were assessed at baseline, 4 weeks, and 6 weeks.

Results: Results: Significant reductions were observed in pain intensity, with mean VAS scores decreasing from 9.7 ± 0.46 at baseline to 4.4 ± 0.80 at 4 weeks and 2.62 ± 0.62 at 6 weeks ($P < 0.0001$). Headache frequency reduced from a median of 11–15 episodes/month to 1–3 episodes/month by week 6. NPQ scores also showed a notable decline, with median scores in males dropping from 18.75% to 9.37% and in females from 16.66% to 8.33%, indicating a significant improvement in neck-related disability.

Conclusion: CMR and TENS significantly reduced headache severity, frequency, and neck disability in TTH patients. This low-cost, non-invasive approach is especially beneficial in resource-limited settings.

Introduction

Headache disorders are among the most prevalent neurological conditions, with tension-type headache (TTH) showing particularly high global incidence.[1] Characterized by mild-to-moderate bilateral, pressing, or constricting pain, TTH can be episodic or chronic, often impairing daily functioning and quality of life.[2] Despite its widespread occurrence, TTH remains underdiagnosed and undertreated due to its less dramatic presentation compared to migraine.[3] The International Classification of Headache Disorders classifies TTH into infrequent, frequent, and chronic types, with chronic TTH defined as headaches occurring on 15 or more days per month for over 3 months.[4] This chronicity contributes significantly to physical and psychological distress.[5]

Historically termed "stress headache" or "muscle contraction headache," TTH is now recognized to involve both peripheral myofascial dysfunction and central sensitization.[6,7] Pericranial muscle tenderness is a consistent feature, underscoring the musculoskeletal basis of its pathophysiology.[8] In this context, non-pharmacological interventions targeting the neuromuscular structures of the head and neck have gained clinical relevance.[9] As a result, non-pharmacological interventions like Cervicogenic Myofascial Release (CMR) have gained importance.[10] CMR aims to reduce myofascial trigger points and improve tissue function, while Transcutaneous Electrical Nerve Stimulation (TENS) offers pain relief through neuromodulation.[11] In addition, TENS is a popular non-intrusive electrotherapeutic intervention to modulate pain.[12] Their combined application may enhance therapeutic outcomes by addressing both mechanical and neurological components.[13]

This quasi-experimental study aims to evaluate the effectiveness of CMR combined with TENS in reducing symptoms of tension-type headache. The Primary objective of this study was to assess changes in pain intensity, frequency, and functional disability, and secondary objective to determine the synergistic effect of CMR and TENS on neuromuscular symptoms and overall headache impact.

Materials and Methods

Study Design:

A quasi-experimental, single-group pretest–posttest study was conducted to assess the effectiveness of Cervicogenic Myofascial Release (CMFR) combined with Transcutaneous Electrical Nerve Stimulation (TENS) in managing Tension-Type Headache (TTH). **CTRI no: CTRI/2023/02/050097 on 27/02/2023.**

Study Setting:

The study carried out at the Physiotherapy OPDs of Chaitanya Physiotherapy Clinic and Kengal Hanumanthaiah Institute of Physiotherapy, Bangalore, selected for their regular caseload of TTH patients and access to trained therapists and equipment.

Study Population:

Adults aged 20–50 years, diagnosed with TTH and associated cervical musculoskeletal dysfunction, were

recruited using purposive sampling. Inclusion required at least one headache episode per month and written informed consent. Exclusion criteria included migraine, neurological disorders, cervical surgery, pregnancy, or lactation. A total of 50 eligible participants were enrolled, and none declined participation

Intervention:

Participants received 12 sessions over 4 weeks (3/week), each lasting ~30 minutes, comprising:

- TENS: Low-frequency (2–10 Hz), high-intensity, 15 minutes/session; electrodes placed bilaterally over cervical paraspinal and upper trapezius muscles.
- CMFR: Manual and self-myofascial release using lacrosse balls, targeting levator scapulae, suboccipital muscles, and upper trapezius; 3 sets of 15 reps per side.

Outcome Measures:

Data were collected at baseline, post-intervention (4 weeks), and follow-up (15 days) using:

- VAS (Visual Analog Scale) for pain intensity
- Headache frequency (days/week)
- Northwick Park Neck Pain Questionnaire (NPQ) for neck-related disability

Data Analysis:

Data were entered in Microsoft Excel and analyzed using SPSS. Descriptive statistics summarized participant data. Paired t-tests and Wilcoxon signed-rank tests assessed pre- and post-intervention differences. A p-value < 0.05 was considered significant.

Ethics Approval:

The study was approved by the Rajalakshmi Hospital Institutional Ethics Committee, Bangalore (Ref: RH/IECIAP-98/28/09/2022). All participants gave written informed consent, and confidentiality was maintained.

Results

A summary of participant demographics is presented in Table 1. The mean age was 46.87 ± 11.23 years, with a slight female predominance. Most participants were married and belonged to the lower socioeconomic group. The majority had a normal or overweight BMI, and a notable proportion reported a family history of headache. Diabetes was the most commonly reported comorbidity. Participants were primarily from nuclear families, and many had experienced symptoms for over five years.

Table 2 displays the mean VAS scores at baseline, 4 weeks, and 6 weeks. Pain intensity significantly declined from 9.7 ± 0.46 at baseline to 4.40 ± 0.80 at 4 weeks and 2.62 ± 0.62 at 6 weeks, with $P < 0.0001$, indicating a statistically significant reduction over time.

Table 3 shows changes in headache frequency. At baseline, 60% of participants reported 11–15 episodes/month. By week 4, most reported 1–5 episodes/month, and by week 6, 90% reported only 1–3 episodes/month, reflecting a substantial and

progressive decline in headache frequency throughout the intervention.

Table 4 presents a gender-wise comparison of Neck Pain Questionnaire (NPQ) percentage scores in subjects before and after treatment. The scores are expressed as medians with interquartile ranges (IQR), which represent the central 50% of the data and help illustrate variability in patient responses. Before treatment, male participants exhibited higher NPQ scores (median 18.75% [IQR: 18.75%, 21.85%]) compared to female participants (median 16.66% [IQR: 13.88%, 19.44%]), with a significant difference ($p < 0.0001$), which indicates males initially experienced greater neck pain-related disability. After the treatment, both groups displayed a substantial decrease in NPQ scores. Post-treatment scores for males were 9.37% [IQR: 9.37%, 9.37%], while females reported a slightly lower median of 8.33% [IQR: 7.63%, 11.11%]. This difference reached statistical significance ($p = 0.046$), suggesting a marginally better improvement in female participants.

Overall, the results demonstrate that the treatment was successful in lowering the impairment caused by neck discomfort in both genders, with a slightly greater post-treatment improvement observed among females (Figure 1).

Table 1. Demographic and Baseline Characteristics (n = 50)

Variable	Category	Frequency (%)
Age Group	20–30 years	9 (18%)
	31–40 years	14 (28%)
	41–50 years	27 (54%)
Gender	Male	18 (36%)
	Female	32 (64%)
Marital Status	Married	44 (88%)
	Unmarried	6 (12%)
Socioeconomic Status	Lower	29 (58%)
	Middle	15 (30%)
	Upper	6 (12%)
Body Mass Index (BMI)	Underweight (<18 kg/m²)	6 (12%)
	Normal (18.5–22.9 kg/m²)	21 (42%)
	Overweight (23–25 kg/m²)	19 (38%)
	Obese (>25 kg/m²)	4 (8%)
Family History of Headache	Yes	19 (38%)
	No	31 (62%)
Comorbidities	Diabetes	21 (41%)
	Heart Disease	12 (24%)
	None	17 (34%)
Family Type	Nuclear	39 (78%)
	Joint	11 (22%)
Duration of Illness	<1 year	3 (6%)
	1–5 years	28 (56%)

	>5 years	19 (38%)

**Values are expressed as number of patients (percentage)*

Table 2. Comparison of Pain Score (VAS Score)

VAS Score	Mean ± SD	P value
Baseline	9.7±0.46	<0.0001
4 Weeks	4.40±0.80	
6 Weeks	2.62±0.62	

**Values are expressed as mean ± Standard deviation, VAS-Visual Analogue Score*

Table 3. Changes in Headache Frequency

Visits	Number of Episodes per month	Frequency (n=50)
Baseline	7-10 episodes	17 (34%)
	11-15 episodes	30 (60%)
	>15 episodes	3 (6%)
At 4 Weeks	1-5 episodes	21 (42%)
	6-10 episodes	29 (58%)
At 6 Weeks	1-3 episodes	45 (90%)
	4-5 episodes	5 (10%)

**Values are expressed as number of patients (percentage)*

Table 4: Comparison of Neck Pain Questionnaire (NPQ) percentage scores between males and females

Treatment Period	Gender	NPQ Score Median	[IQR]	p Value
Pre-treatment	Male	18.75	[18.75-21.85]	<0.0001
	Female	16.66	[13.88-19.44]	
Post-treatment	Male	9.37	[9.37-9.37]	0.046
	Female	8.33	[7.63-11.11]	

**Values are expressed as Percentage*

**NPQ-Neck Pain Questionnaire, IQR- Inter Quartile Ranges*

Figure

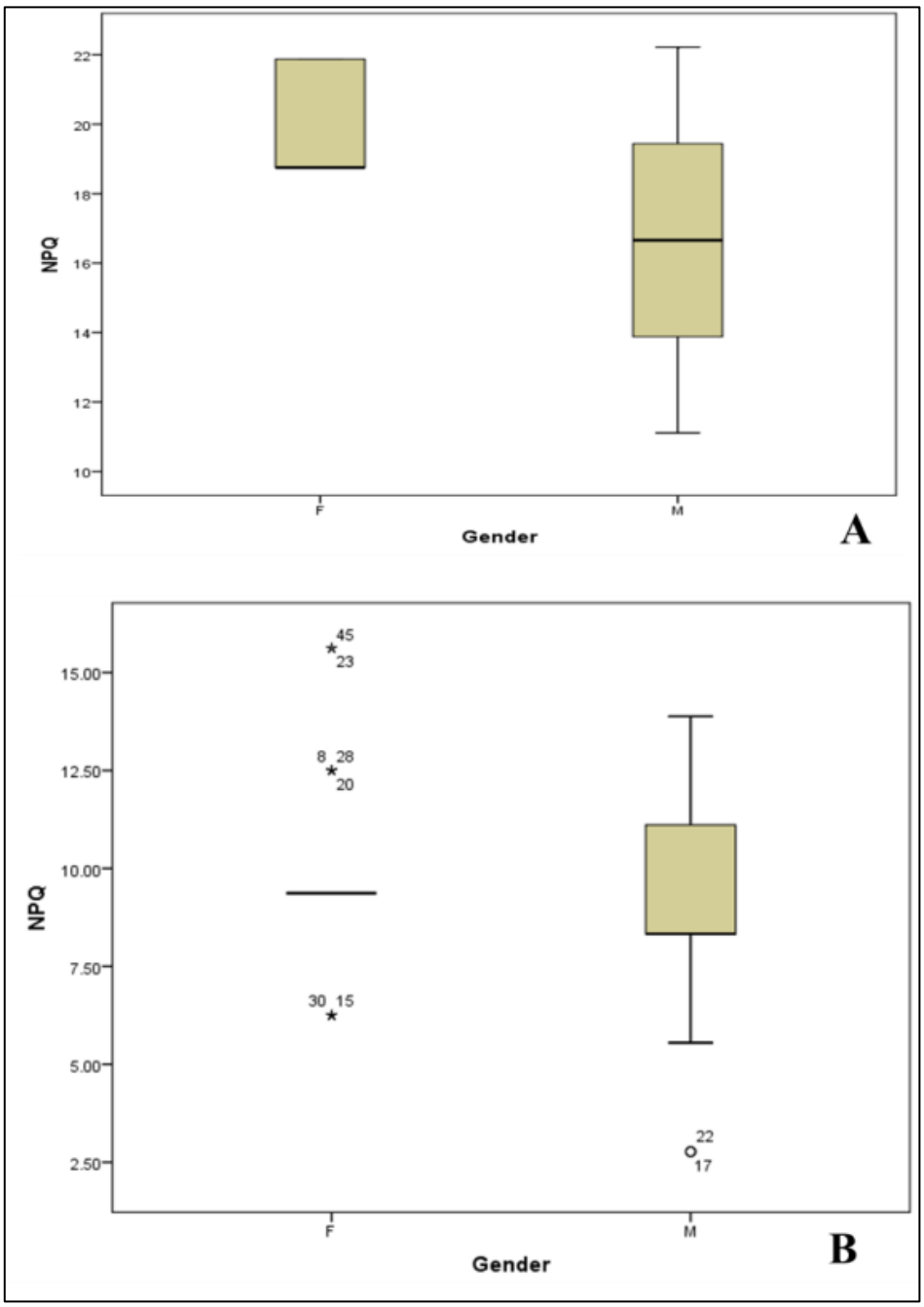

Figure 1: Box-and-whisker plots representing Neck Pain Questionnaire (NPQ) percentage scores by gender.

Discussion

This study assessed the effectiveness of Cervicogenic Myofascial Release (CMR) combined with Transcutaneous Electrical Nerve Stimulation (TENS) in managing Tension-Type Headache (TTH). The intervention significantly reduced headache frequency, pain intensity, and neck disability, while improving cervical muscle function. These findings support the use of combined manual and electrotherapy modalities in TTH treatment.

The results align with previous studies. Corum et al.[14] demonstrated the efficacy of myofascial release in relieving TTH symptoms, while Lu et al.[15] highlighted its role in reducing pain severity. The inclusion of TENS likely enhanced these effects through pain modulation mechanisms. Similar outcomes were reported by Hosseinifar et al.[16], who observed improvements in headache frequency and muscle function following myofascial interventions.

This multimodal approach reflects current chronic pain models, addressing both peripheral dysfunction and central sensitization. Adachi et al.[17] and Jung et al.[18] also showed that physiotherapy targeting cervical myofascial trigger points reduces headache intensity and frequency. Manual therapy, when combined with physical activity, as shown by Cumplido-Trasmonte et al.[19], enhances range of motion and pain relief. Additionally, Repiso-Guardeño et al.[20] supported TENS as an effective short-term intervention for TTH.

Our study found that episodic TTH patients responded faster than those with chronic TTH, suggesting that longer or more intensive interventions may be needed for chronic cases. While the study's practical clinical setting and validated outcome tools are strengths, limitations include its quasi-experimental design, absence of a control group, small sample size, and short follow-up. Pharmacological therapies were not analyzed independently, indicating a need for future research.

In conclusion, combining CMR and TENS is an effective, non-pharmacological strategy to reduce TTH symptoms. This integrated approach can enhance patient outcomes and supports the role of physiotherapy in comprehensive headache management.

Conclusion

This study concludes that the combination of Cervicogenic Myofascial Release and Transcutaneous Electrical Nerve Stimulation therapy is a highly effective, non-intrusive therapeutic approach for alleviating Tension-Type Headache. The integrative protocol resulted in substantial reductions in headache severity, frequency, and disability associated to the neck. Given its efficacy, accessibility, and cost-effectiveness, this approach can be recommended as a frontline conservative management strategy for patients suffering from TTH.

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