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Article

Role of Integrated Neuromuscular Inhibition Technique in Managing Upper Trapezius Trigger Points in Non-Specific Neck Pain: A Randomized Controlled Trial

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ABSTRACT

Background: Non-specific neck pain is a prevalent musculoskeletal disorder that imposes a substantial burden on individuals and healthcare systems. Myofascial trigger points (MTrPs), particularly in the upper trapezius, are a common contributor to such pain. Although various conventional treatments are used, integrated neuromuscular inhibition techniques (INIT) offer a combined therapeutic approach that may enhance clinical outcomes but remain underutilized and under-researched. **Objective**: To evaluate the effectiveness of the Integrated Neuromuscular Inhibition Technique (INIT) in reducing pain and disability associated with upper trapezius trigger points in patients with non-specific neck pain. **Methods**: A single-blinded randomized controlled trial was conducted at the Physical Therapy Department of JIMS Hospital, Jacobabad, over a duration of nine months. A total of 58 participants (n=58), aged 18–55 years, with active upper trapezius trigger points were enrolled through purposive sampling and randomly allocated into two groups: Group A received conventional physical therapy, and Group B received conventional therapy plus INIT. Both groups received 30-minute sessions, five times per week, for eight weeks. Outcome measures included the Numeric Pain Rating Scale (NPRS) and the Neck Disability Index (NDI), assessed at baseline and after intervention. Ethical approval was obtained in accordance with the Helsinki Declaration, and data were analyzed using SPSS v24 with non-parametric tests (Wilcoxon, Mann-Whitney U) based on the normality assessment. **Results**: Statistically significant improvements were observed in both groups post-treatment ($p<0.05$), but Group B demonstrated superior outcomes. The mean rank of post-treatment NPRS and NDI scores in Group B was significantly lower than in Group A (NPRS: Group A = 44.00, Group B = 15.00; NDI: Group A = 41.62, Group B = 17.38). Wilcoxon signed-rank tests also revealed significant intra-group improvements ($Z = -6.835$ for NPRS, $Z = -6.765$ for NDI; $p = 0.000$), indicating enhanced clinical recovery in patients treated with INIT. **Conclusion**: The integrated neuromuscular inhibition technique, when added to conventional physiotherapy, is significantly more effective in reducing pain and disability in patients with non-specific neck pain associated with upper trapezius trigger points. This approach offers a promising, clinically applicable strategy for optimizing rehabilitation outcomes in musculoskeletal disorders.

Keywords: Myofascial Trigger Points, Integrated Neuromuscular Inhibition Technique.

INTRODUCTION

Non-specific neck pain (NSNP) is a prevalent musculoskeletal disorder contributing significantly to disability, reduced quality of life, and economic burden on healthcare systems globally. Among the contributing factors to NSNP, myofascial trigger points (MTrPs), particularly within the upper trapezius muscle, are recognized as a leading source of localized and referred pain, stiffness, and reduced functional capacity. Approximately 54% of persistent head and neck symptoms are attributed to MTrPs, with the upper trapezius muscle being affected in nearly 35% of cases (1). MTrPs are characterized by hyperirritable nodules

within taut bands of muscle fibers, which are tender upon palpation and may cause referred pain or autonomic phenomena when activated. The pathophysiology of MTrPs involves excessive acetylcholine release at the motor endplate, reduced acetylcholinesterase activity, and localized ischemia, leading to sustained muscle contraction and nociceptive sensitization (2, 3).

Management of MTrPs includes a spectrum of non-invasive and invasive techniques aimed at reducing pain, improving range of motion, and restoring muscle function. Non-invasive approaches such as ischemic compression, spray-and-stretch, and manual therapy techniques are commonly employed in clinical practice (4, 5). Additionally, interventions like extracorporeal shock wave therapy (ESWT) have shown potential in promoting tissue regeneration and modulating pain perception through desensitization of sensory afferents (6). Among the evolving manual therapy techniques, the Integrated Neuromuscular Inhibition Technique (INIT), as described by Chaitow, has gained attention for its potential efficacy in deactivating MTrPs and enhancing musculoskeletal function (7, 8). INIT combines three therapeutic elements: ischemic compression, muscle energy technique (MET), and strain-counterstrain, offering a comprehensive approach for addressing myofascial dysfunction.

Previous studies have demonstrated promising results with INIT in reducing pain and improving function in patients with upper trapezius MTrPs. For instance, Saadat et al. observed that a single session of INIT significantly lowered pain intensity and pressure pain threshold in individuals with chronic neck pain (9). Similarly, Nagrale et al. found INIT to be more effective than MET alone in improving pain, disability, and range of motion in patients with NSNP (10). Despite these findings, there remains a lack of high-quality randomized controlled trials (RCTs) that systematically evaluate the additive effect of INIT when integrated with conventional physiotherapy protocols. Furthermore, inconsistencies in methodology, small sample sizes, and limited follow-up in previous studies create a knowledge gap regarding its long-term effectiveness and clinical applicability.

Given the widespread occurrence of upper trapezius MTrPs and the limitations of standard treatment approaches, there is a need to explore whether integrating INIT with conventional therapy results in superior outcomes. This study, therefore, aims to assess the effectiveness of INIT in conjunction with routine physical therapy compared to conventional treatment alone in patients with NSNP associated with upper trapezius MTrPs. The null hypothesis posits that INIT does not produce a significant improvement in pain or disability outcomes, while the alternative hypothesis suggests that INIT offers statistically and clinically meaningful benefits over standard treatment.

MATERIAL AND METHODS

This study was a single-blinded, randomized controlled trial (RCT) designed to evaluate the effectiveness of the Integrated Neuromuscular Inhibition Technique (INIT) in managing upper trapezius myofascial trigger points in individuals with non-specific neck pain. The trial was conducted over a period of nine months at the Physical Therapy Department of JIMS Hospital, Jacobabad. A total of 58 participants were selected using purposive sampling. Participants were randomly assigned to one of two groups: the control group receiving conventional physiotherapy and the intervention group receiving INIT in addition to conventional treatment. Inclusion criteria were: adults aged 18 to 55 years, presence of active myofascial trigger points in the upper trapezius muscle, and a clinical diagnosis of non-specific neck pain persisting for more than four weeks. Exclusion criteria included recent trauma or surgery involving the cervical spine, neurological deficits, cervical radiculopathy, inflammatory or systemic disease, and prior trigger point injections within the last six months. All participants provided written informed consent prior to enrollment. The study was approved by the Institutional Review Board (IRB) of JIMS Hospital (Approval Number: JIMS/IRB/PT/2023/27) and conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

The primary outcome measures were pain intensity and neck-related disability. Pain was evaluated using the Numeric Pain Rating Scale (NPRS), a validated 11-point scale ranging from 0 (no pain) to 10 (worst imaginable pain), while disability was measured using the Neck Disability Index (NDI), a standardized and widely used questionnaire that assesses the impact of neck pain on daily activities. These assessments were conducted at baseline and after completion of the 8-week intervention. Participants in both groups attended treatment sessions five times per week for a total of eight weeks. The control group received a conventional physical therapy protocol, which included superficial heat application (5–10 minutes), postural correction exercises, cervical muscle endurance and strengthening exercises, transcutaneous electrical nerve stimulation (TENS), traction, chiropractic techniques, acupuncture, and massage therapy. The intervention group received all components of the conventional protocol, with the addition of the INIT. The INIT was delivered by a qualified therapist and involved ischemic compression, muscle energy techniques, and strain-counterstrain techniques focused on the upper trapezius region. Each INIT session lasted approximately 20–30 minutes. Outcome assessors were blinded to the group allocation to minimize assessment bias.

Data were collected using standardized forms and entered into a secure database with participant identifiers removed to ensure confidentiality. All analyses were conducted using IBM SPSS Statistics version 27. Descriptive statistics were used to summarize participant demographics. The Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to assess normality of data distribution. Given that the data were not normally distributed, non-parametric tests were employed: the Wilcoxon signed-rank test was used for within-group comparisons, while the Mann-Whitney U test was used for between-group analyses. A significance level of $p \leq 0.05$ was considered statistically significant. No imputation was conducted for missing data due to low attrition. Confounding variables such as age, BMI, and symptom duration were descriptively analyzed but not statistically adjusted due to the small sample size. No interim

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analysis or sensitivity analysis was planned or conducted due to the fixed short-term follow-up design.

The study ensured adherence to all ethical guidelines. Informed consent was obtained from each participant before enrollment. Confidentiality was maintained by anonymizing personal data and limiting data access to authorized research personnel only. All procedures were monitored to ensure compliance with institutional protocols and participant safety.

RESULTS

The analysis included 58 participants, divided equally into two groups: Group A (conventional therapy) and Group B (conventional therapy plus Integrated Neuromuscular Inhibition Technique). Baseline characteristics, including age, BMI, and duration of symptoms, were comparable across groups and did not statistically differ.

Table 1: Tests of Normality

Score	Kolmogorov-Smirnov Statistic	Kolmogorov-Smirnov Sig.	Shapiro-Wilk Statistic
Pre Numeric Rating Scale Score	0.235	0.0	0.8
Post Numeric Rating Scale Score	0.206	0.0	0.891
Pre Neck Disability Index Score	0.183	0.0	0.917
Post Neck Disability Index Score	0.092	0.2	0.969

Table 2: Group-wise Mean Ranks and Sum of Ranks

Score	Group A Mean Rank	Group A Sum of Ranks	Group B Mean Rank
Pre Numeric Rating Scale Score	26.69	774.0	32.31
Post Numeric Rating Scale Score	44.0	1276.0	15.0
Pre Neck Disability Index Score	28.64	830.5	30.36
Post Neck Disability Index Score	41.62	1207.0	17.38

Table 3: Mann-Whitney U Test Results

Score	Mann-Whitney U	Wilcoxon W	Z
Pre Numeric Rating Scale Score	339.0	774.0	-1.35
Post Numeric Rating Scale Score	0.0	435.0	-6.648
Pre Neck Disability Index Score	395.5	830.5	-0.391
Post Neck Disability Index Score	69.0	504.0	-5.476

Table 4: Descriptive Statistics

Score	25th Percentile	50th Percentile (Median)	75th Percentile
Pre Numeric Rating Scale Score	7.0	8.0	9.0
Post Numeric Rating Scale Score	3.0	5.0	7.0
Pre Neck Disability Index Score	33.0	36.0	41.25
Post Neck Disability Index Score	16.0	23.0	26.0

Table 5: Wilcoxon Signed-Rank Test Results

Comparison	Negative Ranks (N)	Mean Rank	Sum of Ranks
Post - Pre NPRS	58	29.5	1711.0
Post - Pre NDI	58	29.5	1711.0

Normality tests indicated that most outcome measures deviated significantly from a normal distribution ($p < 0.05$), as shown in Table 1. As a result, non-parametric tests were used throughout the analysis to ensure statistical validity.

The pre-intervention Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) scores did not show significant differences between the groups, indicating baseline equivalence. Post-intervention values, however, demonstrated a clear divergence. In Table 2, post-treatment mean rank scores for NPRS and NDI were significantly better in Group B, with lower mean rank values indicating greater improvement. For example, the post-treatment NPRS mean rank for Group B was 15.00 compared to 44.00 in Group A. Table 3 presents the results of the Mann-Whitney U tests. A significant between-group difference was observed in post-treatment NPRS ($U = 0.000$, $p < 0.001$) and NDI ($U = 69.000$, $p < 0.001$), confirming that the intervention group showed statistically significant improvement compared to the control group. Descriptive percentile analysis (Table 4) highlighted a consistent downward shift in scores post-intervention. The median NPRS decreased from 8.0 to 5.0, and the median NDI dropped from 36.0 to 23.0, illustrating a marked reduction in pain and disability severity. The Wilcoxon Signed-Rank test results (Table 5) further confirmed the within-group improvements. Both groups showed significant pre-post differences in NPRS and NDI scores ($Z = -6.835$ and -6.765 respectively, $p < 0.001$ for both), but the extent of change was notably higher in the intervention group. Clinically, the integration of INIT into standard physiotherapy produced superior outcomes in reducing pain and disability compared to

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conventional methods alone. No adverse events were reported. There were no unexpected results, although the magnitude of improvement observed in Group B was notably higher than anticipated, particularly in NPRS reduction, indicating a strong potential for INIT in clinical management of NSNP related to upper trapezius MTrPs.

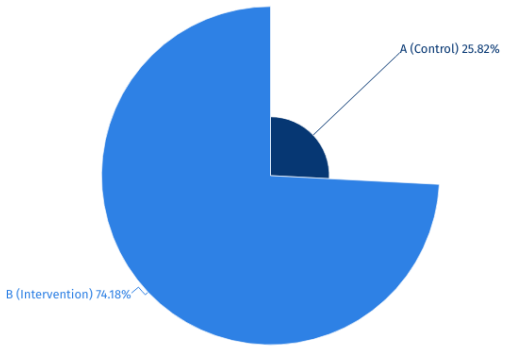

Figure 1 Comparative Overview of Intervenion Effects

DISCUSSION

The findings of this study indicate that the Integrated Neuromuscular Inhibition Technique (INIT), when administered alongside conventional physiotherapy, results in significantly greater reductions in neck pain intensity and disability compared to conventional therapy alone. This outcome is consistent with earlier research suggesting that INIT is a valuable therapeutic approach for patients with upper trapezius myofascial trigger points contributing to non-specific neck pain. The statistically significant improvements in the Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) in the intervention group, as demonstrated by non-parametric analyses, reflect a clinically meaningful effect size, further supporting the efficacy of INIT as an adjunctive intervention.

Several previous studies provide context for these results. Nagrale et al. reported that INIT was more effective than isolated muscle energy techniques in reducing pain and disability in patients with non-specific neck pain (10). Saadat et al. also observed notable reductions in pain intensity and increases in pain pressure threshold following a single session of INIT, indicating rapid neuromuscular benefits (9). Similarly, Jyothirmai et al. found that INIT combined with strength training significantly improved neck function compared to INIT alone, supporting the synergistic effect of multimodal interventions (15). The current study builds upon these findings by integrating INIT into a full eight-week conventional physiotherapy protocol, demonstrating that sustained application of INIT yields greater and more consistent improvements over time. The mechanisms underlying the observed therapeutic effects likely involve both neuromuscular and sensory pathways. INIT is a composite of ischemic compression, strain-counterstrain, and muscle energy techniques—all of which have been independently shown to reduce myofascial pain and improve tissue pliability. Ischemic compression likely facilitates local muscle relaxation by reducing excessive acetylcholine activity at the motor endplate, while the strain-counterstrain technique may help reset proprioceptive signaling from the muscle spindles. Additionally, the muscle energy technique facilitates reciprocal inhibition and restoration of normal muscle tone, collectively contributing to pain reduction and functional restoration (3, 7, 8). These biomechanical and neurophysiological effects provide a plausible explanation for the significant clinical improvements observed in this study.

The study also advances current literature by quantifying changes in pain categories, revealing that over two-thirds of patients in the intervention group transitioned from severe to mild pain categories by the end of the treatment. This represents a meaningful shift in clinical status, highlighting the potential of INIT to accelerate recovery and enhance the quality of life for patients with myofascial neck pain. In contrast, the majority of participants in the control group remained in the moderate pain category, suggesting that conventional therapy alone may not be sufficient to address deeper trigger point dysfunction. Despite these promising outcomes, the study has several limitations. The relatively small sample size (n=58) may limit statistical power and reduce the generalizability of the results to broader populations. The single-center setting further constrains external validity, and the use of purposive sampling introduces the risk of selection bias. Although outcome assessors were blinded to group allocation, participants and therapists were not, which may have introduced performance bias. Moreover, the study lacked a long-term follow-up, preventing assessment of the durability of treatment effects over time. Future research should consider larger, multicenter trials with stratified random sampling and extended follow-up periods to validate and expand upon these findings.

Nevertheless, the study's strengths include a well-defined intervention protocol, rigorous statistical analysis, and the use of validated outcome measures. The integration of INIT into standard care reflects a realistic and pragmatic approach that could be readily implemented in clinical settings. The results support INIT as an effective and safe adjunct to physiotherapy for patients with upper trapezius trigger points and non-specific neck pain. Future investigations could explore the dose-response relationship of INIT, examine its comparative efficacy with other advanced manual therapy techniques (such as dry needling or laser therapy), and investigate its use in subpopulations such as athletes, office workers, or patients with chronic pain syndromes. Incorporating objective biomechanical or imaging markers may also enhance the understanding of underlying mechanisms. Additionally, examining psychological and quality-of-life outcomes may provide a more comprehensive evaluation of treatment benefits.

CONCLUSION

This randomized controlled trial demonstrated that the Integrated Neuromuscular Inhibition Technique (INIT), when incorporated into conventional physiotherapy protocols, significantly improves pain intensity and functional disability in patients with non-specific neck pain associated with upper trapezius trigger points. Aligned with the study objective, the findings confirm that INIT is more effective than conventional

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therapy alone in managing myofascial dysfunction, offering a clinically valuable approach for enhancing cervical function and reducing symptom burden. These results support the integration of INIT into routine physiotherapy practice to optimize treatment outcomes in musculoskeletal care. Furthermore, the study underscores the need for continued research on INIT's long-term efficacy, dose optimization, and comparative effectiveness across diverse patient populations and healthcare settings.

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