DOI: https://doi.org/10.53350/pjmhs2115123673

ORIGINAL ARTICLE

Effects of Neuromuscular Reeducation with Ischemic Compression on Myofascial Trigger Points in Patients with Neck Pain- a Randomized Controlled Trial

KINZA ANWAR[1], HAFSAH ARSHAD[2], SAEEDA TAJ[3], MARIA KHALID[4], ABDUL GHAFOOR SAJJAD[5], ROBINA MALIK[6]
[1]*Senior lecturer, Riphah International University, Islamabad*
[2]*Lecturer, University of Lahore Department of Physical Therapy, Islamabad*
[3]*Lecturer, Bashir Institute of Health Sciences, Islamabad*
[4]*Assistant Professor, Riphah International University, Islamabad*
[5]*HOD/ Associate Professor of Physical Therapy, Shifa Tameer-e-Millat University, Islamabad*
[6]*Senior Physiotherapist, IIMCT-Pakistan Railway Hospital, Rawalpindi*
Correspondence to: Kinza Anwar, Email: kinza.anwar@riphah.edu.pk, Cell: 0323-9735427

ABSTRACT

Aim: To determine the effects of neuromuscular Reeducation technique along with ischemic compression on upper trapezius myofascial trigger points regarding pain and lateral cervical ROM.

Methodology: A randomized controlled trial was conducted.50 patients (25 in each group; aged 32.00 ±7.12 years), diagnosed with neck pain having upper trapezius myofascial trigger points and reduced lateral cervical range of motion were included. Patients were randomized into ischemic compression group (A) and Neuromuscular Reeducation group (B). Both groups were associated with conventional physiotherapy, which continued for two weeks. Outcomes were measured by using a Goniometer for lateral cervical ROM and pain intensity by using NPRS, assessed at baseline and on 8th post-intervention.

Results: 49 participants were analyzed due to a lost in follow-up of one subject from Control Group-A. Intragroup comparison of pre to post value for cervical ROM and NPRS showed a significant (p value=.000) for both groups. Intergroup comparison of baseline to end value for cervical ROM was significantly improved on post-intervention along with significantly improved NPRS

Conclusion: This study concluded that Neuromuscular Reeducation along ischemic compression approach for MTRPs has proven to be more effective to improve cervical range of motion and reducing pain.

Keywords: Myofascial trigger points, Ischemic Compression, Neuromuscular reeducation, Upper Trapezius, Neck pain.

INTRODUCTION

Musculoskeletal pain is commonly present around the neck area which affects about 70% of individuals in a general population .[1]Neck pain is the fourth leading cause of disability with a yearly prevalence of more than 30%[2]. Neck pain in the working population is highly prevalent and women complain of more frequent episodes of neck pain due to myofascial trigger points than men[3]. Myofascial trigger points (MTrPs) are hypersensitive spots, which are the main source of referred pain and decrease range of motion. Literature stated that myofascial trigger points (MTrPs) are knotted, firm, rope-like regions of muscle typically refer to pain on palpation while mechanical stimulation gives a local twitch response[4,5]. MTrPs have been identified as latent or active and significantly affect a person's activities of daily living. Various researches on MTrPs revealed that MTrPs may impair functional capacity by producing muscle weakness, mechanical inefficiency, and imbalances. [6]Active MTrPs produce spontaneous and referred pain while latent MTrPs may generate local or referred pain upon palpation[7]. Latent MTrP has been found mostly in the healthy, non-symptomatic adult female population and it is found that latent MTrPs may later develop into active MTrPs[8]. Postural muscles such as the upper trapezius, gastrocnemius, pelvic girdle muscles and hamstring are often affected by MTrPs[9]. Repetitive functional activities, and postural imbalances, decline the ability of upper trapezius muscle to relax during maximum isometric contractions causes pain in the upper cervical region[10].

Upper trapezius muscle fibers have two central regions for the existence of MFTP's, categorized as MTrP 1 and MTrP 2. Biochemical imbalances such as MTrPs can be corrected by medications, Needling, Stretching, ischemic compression, deep friction massage, manual techniques (muscle energy technique, strain counter strain), and Chiropractic techniques[11]. MTrPs detection can be done usually by exerting deep pressure on affected areas through palpation.

The ischemic compression technique (ICT) comprises the direct application of a persistent digital/mechanical pressure over the trigger point to reduce the blood flow for a specific period. ICT may induce analgesia, increase the ROM of muscle by decreasing pain threshold and abnormal contraction by deactivation of MTrPs[12,13]. However, Neuromuscular Reeducation (NMR) functions to break down the adhesions in a precise and controlled way, facilitating body to replace the scar tissue with healthy muscle and connective tissues. It is a non-invasive soft tissue technique blend of deep pressure along with active movement of a patient to release pain and adhesions in the muscular and fascial sheath. It is suggested that the Neuromuscular Reeducation approach helps to regain normal ROM and strength by overcoming muscular tenderness and pain[14]. Many systemic reviews suggested that the combination of ICT technique with other soft tissue techniques (muscle energy technique/ strain counter strain have a beneficial effect on trigger point deactivation[15].

Currently, lack of quality evidence on the effectiveness of the Neuromuscular Reeducation technique in neck pain.

Therefore, this study aimed to evaluate the effectiveness of the Neuromuscular Reeducation technique along with ischemic compression on upper trapezius myofascial trigger points regarding pain and lateral cervical ROM.

METHODOLOGY

A randomized, parallel control trial was conducted at physical therapy OPD of Railway Rehabilitation center, Railway General Hospital Pakistan. Ethical approval was taken from the ethical review committee of Riphah College of Rehabilitation Sciences (RCRS) (Riphah/RCRS/REC/000177). The detailed treatment procedure was explained to participants along with risks and benefits and written informed consent was taken.

Subjects who visited the physical therapy OPD, and were clinically diagnosed with neck pain, associated with myofascial trigger points (MTrPs) were screened for the study. Participants aged 18-55 years including both gender with neck pain >1 month, presence of MTrPs in upper trapezius muscle leading to decrease range of motion of cervical lateral flexion to the contralateral side and having pain >5 on the NPRS scale were included in the study[16]. MTrPs in the upper trapezius muscle were diagnosed by the presence of hypersensitive tender spot with a palpable taut band, referred pain of the MTrPs in response to compression, and jump signs as winces, cry, or withdrawal symptoms. Exclusion criteria were: The subjects had a recent history of cervical spine trauma, malignancy, had arthritis in the neck or shoulder, were diagnosed with fibromyalgia syndrome according to the American College of Rheumatology criteria[17], any history of neck or shoulder surgery in the previous year, was diagnosed with cervical radiculopathy and myelopathy and subjects that undergo manual treatment within a month before the study[16,17].

The subjects were randomly divided by the coin toss method in a 1:1 ratio to either control group-A (n= 25) and interventional Group-B (n=25) by using a convenient sampling technique. Measurement was performed at baseline, and at the end of treatment (2 weeks follow up), using a semi-structured questionnaire. (Figure 1)

Measures: Outcomes were measured by using a Goniometer for lateral cervical ROM and pain intensity by using NPRS. The Goniometer is used in patients who have an decrease ROM due to muscle tenderness.[18] To measure cervical contralateral flexion ROM, the participant was asked to sit upright on a chair with a relaxed shoulder. The center of goniometer arm was placed on occipital protuberance with the fulcrum of the goniometer was kept on the spinous process of the first thoracic spine at right angles. Additionally, horizontal arm was manually stabilized while the vertical arm was moved according to the movement of the head of the participant. The CROM device demonstrated good-to-excellent inter-rater reliability (0.73-0.89).

Self-reported, unidirectional, numerical pain rating scale (NPRS) is a reliable and valid instrument to record the pain intensity in individuals because of its ease of handling. Patients directly expressed and rated their level of pain by an 11-point i.e. scale ranging from 0 (“no pain”) to 10 (“worst imaginable pain”).

Intervention: Control Group-A received (ICT + conventional therapy) and Interventional Group-B received (ICT+NMR+ conventional therapy). The Conventional therapy given to the participants of both groups consisted of heat therapy for the upper trapezius trigger points using a moist hot pack for 8 min, followed by therapeutic ultrasound. Ultrasound was applied for 10 min with a frequency of 3 MHz and intensity of 1 W/cm^2.[19, 20] Stretching exercises of the upper trapezius were also given to the participant with a hold-relax of 10 s for 10 repetitions per session.

For Control Group-A: The Subject was placed in a comfortable position received conventional therapy and ICT. This ischemic compression technique reduces the cycle of pain–spasm–pain by decreasing the local mechanosensitivity of MTrPs. In ICT the affected side was palpated to determine the presence of MTrPs in the upper trapezius and marked with a skin marker. The Pressure was applied to the upper trigger point via a pincer clasp. Continued light pressure which was gradually increased applied for 90 secs, to the participant's maximum pain tolerance level. This technique was given 3–5 times in every session with a 1-min rest between every compression to allow blood reperfusion of the involved site.

In interventional Group-B subjects received conventional therapy, ICT and NMR technique. NMR is a valid soft tissue technique to break adhesion, decrease inflammation. and improving range of motion. The Subject is seated in a comfortable, head-neutral position with a physiotherapist on the same side. As the patient contralateral laterally flex the cervical with ipsilateral shoulder > 90° abduction, the physiotherapist with two thumb contact applied deep pressure on the muscle belly of upper trapezius, beginning at the base of the neck moving towards insertion at lateral third of clavicle. This technique was given 5 times in every session with a 10-sec rest between every pressure. Both groups received interventions for 4 times in week for 2 consecutive weeks.

T he Sample size was calculated with the help of Epi Tool. Statistical analysis was conducted by using IBM SPSS 24 and conveyed in the form of tables. Descriptive analysis was performed for the demographic variables. Shapiro-Wilk was used to assess data distribution. It was shown that data was normally distributed for the lateral cervical range of motion. So parametric test was applied to the lateral cervical ROM using independent t-test and paired t-test. But the p-value of NPRS is less than 0.05 at 95% confidence interval, so the non-parametric test was applied using the Wilcoxon signed ranked test and Mann Whitney U- test.

RESULTS

In total 70 subjects were assessed for eligibility, 50 participants (35 females and 14 males), fulfilled the inclusion criteria. During the study, one subject from the control group was lost in follow-up due to some personal reasons, as outlined in Figure 1. Overall 49 participants were analyzed in which mean age was 32.00 ±7.12. A comparison between the groups implied normal demographic distribution. The majority of the participants

80.0 %, were housewives having associated problems of muscle spasm. Descriptive characteristics are found in (Table 1).

Paired t test determined the intragroup comparison of pre-value (baseline assessment) to post-value (2 weeks' follow-up) for cervical ROM, a significant difference was found for group A (mean difference = -7.333; p value=.000***); and group B (mean difference =-12.8; p value=.000***).

Wilcoxon signed-rank test determined the intragroup comparison of pre-value (baseline assessment) to post value (2 weeks' follow-up) of NPRS, showed statistically significant values (p value=.000***) for both group A and B. (Table 2)

Intergroup comparison of baseline to end value was done by Independent T-test. Cervical ROM was significantly improved on post-intervention (p value= .000***) with marked mean difference value (mean difference= -5.721). Mann–Whitney U-test was used for between-group analysis at the baseline and after 2 weeks of follow-up. NPRS was significantly improved (P < 0.001) on post-intervention having a z value (-5.311) (Table 3).

Table 1: Demographic Data MTrPs: Myofascial trigger points.

Variables	Control Group-A n=24 (n) %	Interventional group-B n=25 (n) %	Both groups n=49 (n) %
Gender			
Female	17 (68)	18 (72)	35(70)
Male	7 (28)	7 (28)	14(28)
Occupation			
Housewife	10 (40)	10 (40)	20(80)
Student	4 (16)	5 (20)	9 (18)
Office worker	5 (20)	7 (28)	12(24)
Labourer	5 (20)	3 (12)	8 (16)
Duration of pain			
< 1 month	7(28)	13(52)	20 (40)
<3 month	11(44)	9 (36)	20 (40)
> 3 months	6 (24)	3(12)	9 (18)
Associated disorders			
Muscle spasm	8 (32)	14(56)	22(44)
Cervical headache	10 (40)	8 (32)	18(36)
Spondylosis	6 (24)	3 (12)	9(18)
Trapezius MTrPs			
Right side MTrPs	15 (60)	16 (64)	31(62)
Left side MTrPs	9 (36)	9 (36)	18 (36)

Table 2: Within group comparison of pre- and posttest scores of Cervical ROM & NPRS

Variable	Group (n=49)	Pre-intervention(Mean±SD	Post-intervention(Mean±SD)	Mean Difference	p-value
Cervical ROM	Control Group(n=24)	24.6±5.17	31.9±5.19	-7.333	.000***
	Experimental Group (n=25)	24.8± 4.00	37.6±2.79	-12.8	.000***
NPRS	Group (n=49)	Pre-Median ±IQ	Post-Median ±IQ	Z-value	p-value
	Control Group(n=24)	7.0(2.0)	5.0(1.0)	-4.356	.000***
	Experimental Group (n=25)	7.0(1.5)	3.0(1.0)	-4.424	.000***

Cervical ROM: Cervical range of motion, NPRS: Numeric pain rating scale

Table 3: Inter group comparison of baseline and post treatment measurement for Cervical ROM & NPRS

Variable	Group(n=49)	Pre-Intervention (Mean±SD)	Post-Intervention (Mean±SD)	Mean Difference	p-value
Cervical ROM	Control (n=24)	24.6±5.17	31.9±5.19	-0.255	0.847
	Experimental(n=25)	24.8±4.00	37.6±2.79	-5.721	.000***
NPRS		Pre-Intervention(Mean Rank)	Post-Intervention(Mean Rank)	Z-value	p-value
	Control (n=24)	26.0	35.8	-0.547	0.585
	Experimental(n=25)	23.9	14.6	-5.311	.000***

Cervical ROM: Cervical range of motion NPRS: Numeric pain rating scale

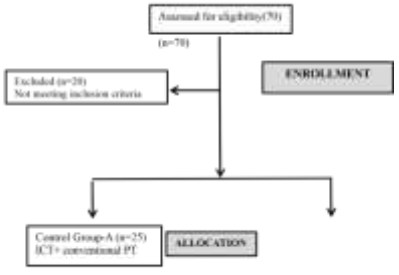

Figure 1: CONSORT diagram:

DISCUSSION

The current study was intended to find the effect of neuromuscular reeducation and ischemic compression on reducing neck pain and improving cervical lateral ROM in patients with MTrPs on the upper trapezius muscle. Literature review showed that clinical trials are needed as there is a lack of evidence available on the effect of neuromuscular reeducation technique. The findings of the intergroup revealed both groups yielded improvement for neck pain and cervical lateral ROM. But an interventional group that received sustain ischemic pressure along neuromuscular reeducation showed a marked increase in cervical ROM than a control group. In addition, Intragroup analysis showed both groups produce a remarkable reduction of pain by deactivating MTrPs of the upper trapezius muscle. The ROM variable also showed improvement in intragroup analysis yet marked changes were observed in the interventional group. Improvement in outcomes was observed in all findings but the

neuromuscular reeducation (NMR) approach showed considerable promising effect by improving cervical lateral ROM.

Results of some previous clinical trials in which a combination of techniques was used are in line with this study in terms of deactivation of Upper trapezius MTrPs and improvement in lateral cervical range of motion. A study held by Amit V. Nagrale et al in their trail on effect of integrated neuromuscular inhibition method (INIT) on trigger points on upper trapezius with non-specific neck pain the treatment of neck pain proposed beneficial effect of integrated approach that include i.e.; muscle energy techniques (MET), ischemic compression (IC), and strain-counter strain (SCS) in deactivating upper trapezius trigger points[21].

Outcomes of this study correlate the findings of our study in which collaboration of Ischemic compression with variable soft tissue interventions produce potential benefit by reducing pain and discomfort of MTrPs. Same findings were observed in the latest study conducted by Waseem et al. in which a combination of treatment approaches was more productive than conventional physical therapy alone on pain and cervical range of motion in patients with upper trapezius trigger points[22].

The results of our study can be acknowledged by the outcomes of previous studies declared by Mansoureh Togha et al.[23] Nasb et al. [24] and other researchers.

Furthermore, a study conducted by Amir Iqbal et al on myofascial trigger points of upper trapezius to estimate the instant and short-term effect of the combination of two soft tissue techniques. They combined conventional physical therapy treatment with ischemic compression and muscle energy technique for a 2 weeks' follow-up. This study observed the effective pain relief and instant decline in local mechanosensitivity of upper trapezius trigger points. The outcomes achieved by this study are quite similar to our clinical trial in terms of 2 weeks follow-up, pain relief, and turn down muscular tenderness by improving ROM. [17] Another study conducted by Ganesh GS et al; on upper trapezius trigger point showed statistically significant improvement in cervical joint ROM and pain reduction within 2 weeks of the therapeutic course[25].

CONCLUSION

Presence of myofascial trigger points in the upper trapezius muscle is the common source of neck pain, muscle tenderness, and reduced cervical range of motion. Sustain ischemic compression technique and combination of sustain ischemic compression along Neuromuscular Reeducation are equally effective for decreasing pain and deactivation of upper trapezius trigger points. Combination of sustain ischemic compression to Neuromuscular Reeducation underwent a greater improvement regarding lateral cervical range of motion.

Limitations: The current study has some limitations, firstly the study has small sample size. In addition, the short-term effect of combined soft tissue techniques was assessed on upper trapezius myofascial trigger points. Therefore, future studies would be conducted with on longer follow-up duration, by using advanced objective tools such as finger pressure algometer and isokinetic machine to identify the amount of pressure and amount of muscle contraction, respectively.

Conflict of interest: The authors declare no potential conflict of interest for this study.

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