

Effect of muscle energy technique versus positional release technique in computer workers with upper trapezius muscle spasm: A comparative study

¹ Dr. Priyanka Devang Rana, ² Dr. Bhoomika Brahmabhatt

¹ 2nd Year MPT-Orthopaedic Condition, Parul University, Ahmedabad, Gujarat, India

² Senior Lecturer, MPT-Orthopaedic Conditions and Pursuing Ph.D, Ahmedabad Physiotherapy College, Parul University, Bopal Ghuma, Ahmedabad, Gujarat, India

Abstract

Context: Upper trapezius muscle is most commonly affected in neck pain in about two thirds of people.

Aims: To compare the effectiveness of Muscle Energy Technique (MET) versus Positional Release Technique (PRT) in terms of subjective improvement in Pain, Range of Motion and Function in computer workers suffering from trapezius muscle spasm.

Settings and Design: Randomized comparative study

Methods and Material: All computer worker with trapezius muscle spasm was screened for inclusion and exclusion criteria. Then patient were allocated into two groups (30 subjects in each), MET+TENS and PRT+TENS by using computer generated random sampling. Outcomes were measured using Visual Analogue Scale, Neck Disability Index Score, Cervical ROM was measured using Universal Goniometer and Manual Muscle testing done for 3 sessions per week for 4weeks.

Statistical analysis: Paired t-test and unpaired t-test was used to compare effectiveness of the techniques.

Result: A total of 56 subjects, 26 in MET+TENS and 30 in PRT+TENS group were enrolled. VAS and NDI score reduction was seen around 74% and 80% & 50 and 55% respectively ($P < 0.0001$). In our study ROM was increased by 3-11% & 5-16% in MET and PRT group ($P < 0.0001$). MMT was increased by 11-16% & 18-22% in MET and PRT group ($P < 0.0001$). Group B is superior in all respects and our result suggest concludes pain relief and Group A delayed pain relief. VAS and NDI score was valid, well-constructed, reliable, consistent and valid ($r = 0.94, 0.92, 0.91, \alpha = 0.83$ and $r = 0.89, 0.86, 0.86, \alpha = 0.75$, respectively).

Conclusions: PRT was more statistically and clinically superior for decreasing VAS, NDI score and improving ROM and MMT. PRT showed earlier pain relief as compared to MET. So, if patient requires prompt pain relief positional release technique is the best treatment which can be offered by Physiotherapist.

Keywords: MET, MMT, NDI, ROM, PRT and VAS

Introduction

Upper trapezius muscle is most commonly affected in neck pain [1]. There is a strong association between perceived neck/shoulder pain intensity and trapezius muscle tenderness in office computer workers. Mean point prevalence of 13 % and mean lifetime prevalence of 50 % [2].

Muscle spasms are often accompanied with muscle tingling, pain, stiffness, and weakness

For the deactivation of Trigger Points (TrPs) and decrease spasm Manual approaches like Muscle Energy Techniques (METs) and Positional Release Technique (PRT) is very effective [3].

MET was first described in 1948 by Fred Mitchell. The approach involves the introduction of an isometric contraction to the affected muscle producing post isometric relaxation through the influence of the Golgi tendon organs (autogenic inhibition). MET may be used to decrease pain, stretch tight muscles and fascia, reduce muscle tonus, improve local circulation, strengthen weak musculature and mobilize joint restrictions [4, 5].

Lawrence H. Jones invented PRT. This technique involves passive body positioning, which is claimed to elicit immediate and prolonged reductions in tenderness at trigger points and to reduce pain and with musculoskeletal conditions. PRT relies on precise positioning of dysfunctional tissues in ways that

allow a spontaneous response that releases or reduces excessive tension and/or spasm. The mechanisms are thought to result from spindle resetting, reduction in nociceptive sensitivity and circulatory enhancement. [6].

Objective

Effect of Muscle Energy Technique (MET) versus Positional Release Technique (PRT) in computer workers with Upper Trapezius Muscle Spasm.-A Comparative study.

Materials and Methods

A total of 60 Computer workers at Parul University, were accessed after obtaining IEC approval and patients consent form. Computer workers of age 18-35 years, either of gender, unilateral trapezititis with tenderness. (More than Grade 2) [7], Duration of pain less than 1 month. (Subacute) [8], VAS score of more than or equal to 5, NDIQ score of more than or equal to 15 score, Computer worker able to attend at least 3 sessions per week for at least 4 weeks, be in good health and have a unilateral spasm of the trapezius muscle were included in the study.

In our study exclusion Criteria [9]: were Any Congenital anomalies like cervical rib etc., past history of Cervical Trauma, Cervical Radiculopathy, Patient with bilateral trapezius spasm, history of trauma or fracture in upper limb &

neck, patient suffering from Diabetes Mellitus, any Patient with history of recent surgery to neck or upper back., any patient with neurological complication and any patient with psychological complication were excluded. Tenderness of the patients suffering from trapezius muscle

spasm were graded according to soft tissue tenderness grading scheme [10]. Initial evaluation of their trapezius muscle spasm was done by using outcome measures. Then subjects selected for the study were allocated into two groups by Computer generated random sampling method.

Table 1

Time	Clinical History	Inclusion/ Exclusion criteria	NDI	ROM	VAS	TENS	MET Group A	PRT Group B
Day 0	√	√	√	√	√	√	√	√
Week 1	-	-	-	-	-	√	√	√
Week 2	-	-	-	-	-	√	√	√
Week 3	-	-	-	-	-	√	√	√
Week 4	-	-	-	-	-	√	√	√
Last day	-	-	√	√	√	-	-	-

Group-A MET (Muscle Energy Technique) + TENS and Group-B PRT (Positional- Release Technique) + TENS Consisting 30 participants in each group.

After knowing detailed procedure total 4 subjects were dropped out from Group A. So, Group A was having total 26 subjects and Group B was having total 30 subjects.

Application of TENS- The negative electrode of the TENS unit will be placed on the MTrp (myofascial trigger point) of the upper trapezius muscle and the positive electrode on the acromion tendon insertional site of the trapezius muscle. The current to be applied at a pulse repetition frequency of 100Hz and duty cycle of 250s, the intensity will be set at a level that each subject should feel but will not be strong enough to induce muscle contraction. The current needs to be applied for 20 minutes [11].

Application of Post-isometric relaxation MET -Total 26 subjects were given MET treatment after drop out of 4 subjects from this group. First TENS applied for 20 minutes as described above. In this isometric technique, the patient lies supine, head/neck flexed and side bent away from the side to be treated, up to or short of the restriction barrier (at the barrier if acute or short of the barrier if chronic, as appropriate) with the practitioner stabilizing the shoulder with one hand and cupping the ear/mastoid area on the same side with the other. In order to bring into play all the various fibers of the muscle, this stretch needs to be applied with neck in three different positions of rotation, coupled with the side bending, as described: With the neck flexed, side bent and fully rotated the posterior fibers of upper trapezius are involved in any contraction (as are levator scapulae fibers).

This maneuver may be performed with the practitioner's arms crossed, hands stabilizing the mastoid area and shoulder, or not, as comfort dictates and with practitioner standing at the head or the side, also as comfort dictates. The patient introduces a resisted effort to take the stabilized shoulder towards the ear (a shrug movement) and the ear towards the shoulder. The double movement (or effort towards movement) is important in order to introduce a contraction of the muscle from both ends. The degree of effort should be mild and no pain should be felt. The subjects then shrugged the stabilized shoulder towards the ear at a sub maximal pain-free effort (20% of the available strength). After the 7-10 seconds of contraction, followed by complete relaxation of effort.

Then the practitioner gently eases the head/neck into an increased degree of side bending flexion and rotation to advance the stretch placed on the muscle. This position will be

maintained for 30 seconds and repeated three to five times per treatment session [7, 14].

Application of PRT-Total 30 subjects were given Positional Release technique after application of TENS for 20 minutes as described above. The subject was in supine with therapist standing on the affected side, tender points were located along the upper fibers of the trapezius. Then therapist applied Pressure by pinching the muscle between the thumb and fingers. The subject's head was laterally flexed toward the side of tender point, then therapist grasps the subject's forearm and abducts shoulder to approximately 90° and adds slight flexion or extension to fine-tune. The ideal position of comfort achieved was held for a period of 90 seconds and followed by a passive return of the body part to an anatomically neutral position continued for 5minutes [12]. Treatment duration: 3 sessions per week for 4 weeks. i.e. Computer workers will receive 3 sessions/ week of interventional therapy for the duration of 4 weeks. [5, 13, 14]

Outcome Measures

Neck Disability Index Questionnaire for functional disability: The NDI was scored from 0–50 points (0–100%) in which higher scores correspond to greater levels of disability. Using this system, a score of 5–14 points (10– 28%) was considered to constitute mild disability, 15–24points (30–48%) was considered to constitute moderate disability, 25–38 points (50–68%)was considered to constitute severe disability, and scores above 34points (68%) indicate complete disability [15, 16].

Goniometer for Cervical Flexion ROM measurement [17]:

Goniometer Alignment

1. Center the fulcrum of the goniometer over the external auditory meatus.
2. Align the proximal arm so that it is either perpendicular or parallel to the ground.
3. Align the distal arm with the base of the nose. If a tongue depressor is used, align the arm of the goniometer parallel to the longitudinal axis of the tongue depressor.

Manual Muscle Testing [18]

Grades for a manual muscle test are recorded as numerical scores ranging from zero (0), which represents no activity, to five(5), which represents a "normal" or best-possible response to the test or as great a response as can be evaluated by a manual muscle test.

MMT-Position of Patient

Table 2

Extension
Grade IV & V: Prone with head off end of table, arms at side Grade III: Prone with head off end of table and supported by therapist, arms at side.
Flexion
Flexor Muscles: Sternocleidomastoid, Longus Coli & Scalenus Anterior Supine with head on table with arms at sides.
Rotation
Sternocleidomastoid, Trapezius & Levator Scapulae Grade V, IV & III: Supine with cervical spine in neutral & head supported on table with face turned as far to one side as possible.

Visual analog scale: It was used to document subjective pain rating method. Algometry was used to measure the pain threshold at the designate trigger point. The VAS is a 10 cm long horizontal line with polar descriptors of ‘no pain’ and ‘worst pain’ possible. A visual analog scale (VAS) was used to grade their level of neck pain [19].

Statistical Analysis

Normality of the data was checked by Shapiro-wilk test. Descriptive statistics and Chi square test was used to analyze baseline data for demographic data. Paired t test was used to find the significance of parameters pre and post-test. Unpaired t test was used for comparing both the group for parametric data. Minimum and Maximum values of variables were analysed by the statistical package for social science (SPSS) version 23.0(IBM, Corporation).

Result

A comparative study consisting of 56 subjects which randomized in to 2 groups, 26 subjects in Muscle energy Technique(MET) group and 30 subjects in Positional Release Technique(PRT) group. Table 3 Shows baseline characteristic of subject mean age of Group A 26.96 and Group B 26.50 years Both the groups were comparable, as no difference was seen statistically. P value less than 0.05 was considered significant. (Unpaired t test) Both the groups were comparable for gender, as no difference was seen statistically. **P=0.2879**. Table 4 gives value of validity and reliability of outcome measures. Figure 1,2,3,4 depicts changes in VAS, NDI, ROM and MMT.

Table 3: Baseline Characteristics

		MET Group A (n=30)			PRT Group B (n=26)			Difference between two groups
Age		26.96±2.46			26.50±3.33			0.5628
Gender	Male	17			15			0.2879
	Female	9			15			
		Pre	post	P value	Pre	post	P value	
VAS		6.33±1.18	1.63±1.20	Less than 0.0001	6.48±0.93	1.25±0.45	Less than 0.0001	Less than 0.0001
NDI		36.35±7.73	16.50±5.75	Less than 0.0001	35.70±7.73	14.33±4.61	Less than 0.0001	0.0371
ROM								
Flexion		43.31±6.45	45.38±5.69	Less than 0.0001	43.83±5.54	46.70±4.41	Less than 0.0001	0.0035
Extension		55.12±7.09	56.50±6.04	Less than 0.0001	55.03±7.11	57.53±5.08	0.0004	0.0141
Lateral flexion-affected		39.77±3.98	42.35±2.59	Less than 0.0001	36.40±5.18	42.17±3.26	Less than 0.0001	Less than 0.0001
Lateral flexion-unaffected		44.15±0.92	44.62±0.64	0.0027	43.83±1.12	44.67±0.71	Less than 0.0001	0.0003
Rotation-affected		73.46±4.57	75.23±3.84	Less than 0.0001	73.83±5.23	76.50±3.48	0.0001	0.0187
Rotation-unaffected		78.46±1.24	78.69±1.19	0.0112	78.27±1.55	79.10±1.32	0.0016	0.0866
MMT								
Flexors		3.81±0.63	4.42±0.58	Less than 0.0001	3.73±0.64	4.53±0.57	Less than 0.0001	Less than 0.0001
Extensors		4.04±0.53	4.54±0.51	Less than 0.0001	4.03±0.49	4.77±0.43	Less than 0.0001	Less than 0.0001
Lateral flexors affected		3.88±0.65	4.50±0.51	Less than 0.0001	3.87±0.63	4.60±0.50	Less than 0.0001	0.0036
Lateral flexors unaffected		4.77±0.43	4.92±0.27	0.0430	4.67±0.48	4.83±0.38	0.0226	0.7772
Rotators-affected		3.88±0.65	4.31±0.68	Less than 0.0001	3.90±0.66	4.63±0.49	Less than 0.0001	Less than 0.0001
Rotators-unaffected		4.81±0.40	4.92±0.27	0.0830	4.70±0.47	4.83±0.38	0.0434	0.5016

Table 2: Validity of Scales

	Validity	Reliability	Internal Consistency	Construct Validity
VAS	Pearson r=0.94 (CI=0.89-0.99)	Test-retest ICC=0.91 (CI=0.88-0.94)	Crohnbachs alpha=0.83	Pearson r=0.92 (CI=0.89-0.95)
	p<0.05	p<0.05	p<0.05	p<0.05
NDI	Pearson r=0.89 (CI=0.854-0.926)	Test-retest ICC=0.86 (CI=0.84-0.88)	Crohnbach's alpha=0.75	Pearson r=0.86 (CI=0.84-0.88)
	p<0.05	p<0.05	p<0.05	p<0.05
		p<0.05		

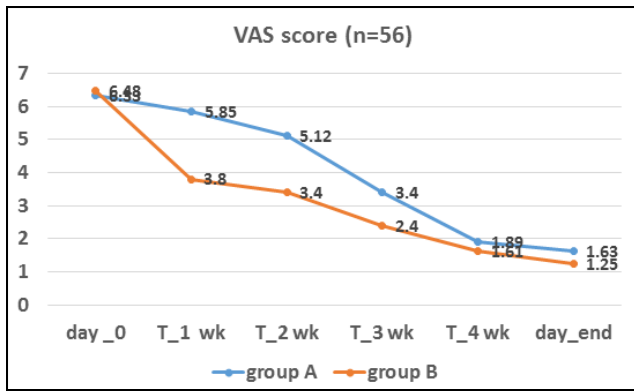


Fig 1: Difference in VAS score at different week

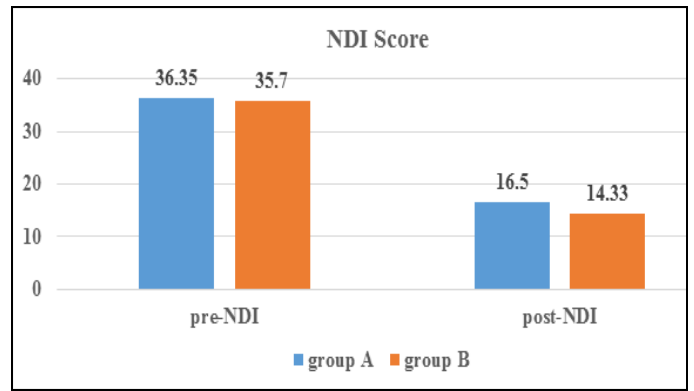


Fig 2: Change in NDI Score

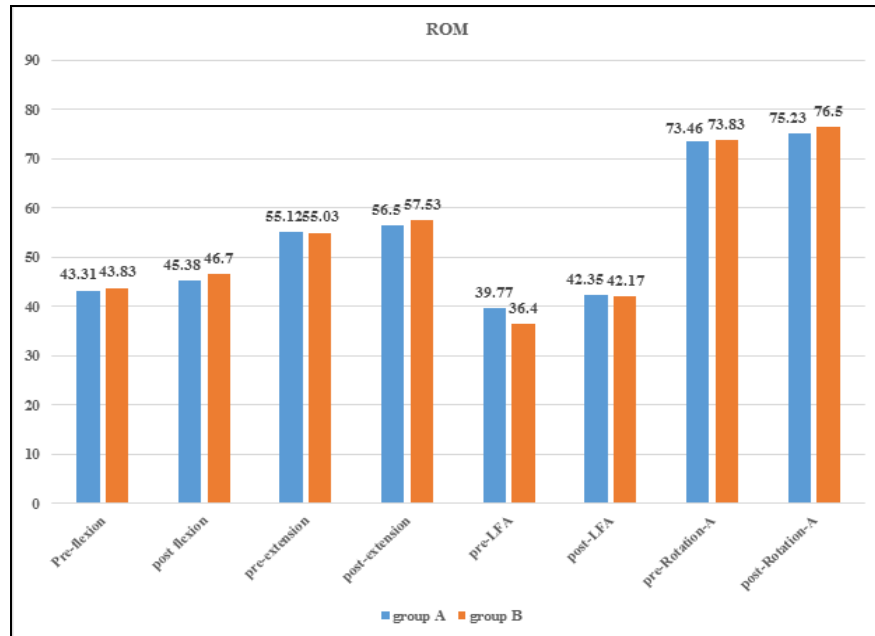


Fig 3: Change in ROM

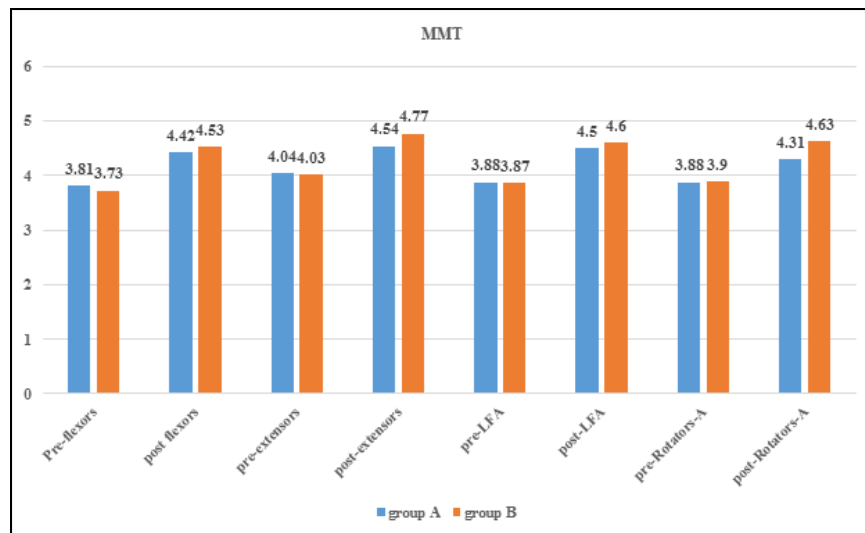


Fig 4: Change in MMT

Discussion

Our study was aimed to compare the Muscle energy technique versus Positional release technique in computer workers with upper trapezius muscle spasm.

Demographic characteristics

We enrolled 56 patients, 26 and 30 patients in two groups, respectively. Based on previous studies we took alpha error=0.05, power of 80%, so sample size was calculated as 30

in each group. In our study, there were 4 patients loss to follow up, the reasons for the follow up was due to shifting of patients to other job sites. Study done by Richa Mahajan *et al.*, Ghiasi *et al.*, Gopal S Nambi *et al.*, Sweety *et al.*, Naik Prashant *et al.*, Javed *et al.* *et al.* and Ali Ghanbari *et al.* all took 30-60 patients, this was similar to our study [4, 20, 5, 8, 21, 22, 23].

Previous studies reported 20-40 years in the patients, in our study also reported mean age group of 26 years, which suggest computer workers are of adult age group. In our and previous studies shows female preponderance, which suggests that female musculature are more prone for trigger point pain.

In both the groups, baseline demographic characteristics were similar and there was no statistical difference in both the groups and so they were comparable.

Visual Analogue Scale

Richa Mahajan [4] demonstrated 77% reduction in VAS score for MET group, Gopal Nambi [5] reported almost 50% reduction in VAS score Naik Prashant [21] reported almost 72% reduction in VAS score. Our study reported almost 74% reduction in VAS score which was very consistent with the earlier studies. We reported in our study 80% reduction in VAS score in PRT + TENS group. Sweety Charles Carvalho, *et al.* (2014) [9] demonstrated 78% reduction in VAS score. Similarly A. Kumaresan *et al.* [24] stated in their study that both positional release therapy showed significant difference in the intensity of pain within the groups and between the groups on the 7th day of treatment. Reduction in pain intensity was strongly significant in the positional release therapy group.

Reduction in the pain intensity was significant in both the groups i.e. MET and PRT. Pain relief could have occurred due to decrease in the intrafusal and extrafusal fiber disparity and reset of the inappropriate proprioceptive activity. Korr has provided a conceptual model how different manipulative technique like isometrics and stretching may be effective in treatment of somatic dysfunction. Our study findings were similar to previous studies. [25, 26]

Neck Disability Score

In our study, MET + TENS group 60% reduction in NDI score was observed. Richa

Mahajan [4] reported 50% reduction in NDI score. Naik Prashant [21] reported no change in MODQ score, in contrast we used NDI which is more sensitive and specific questionnaire. With help of MET concluded that this technique may have a significant role in improved range of motion, reduced pain in the management of upper trapezius MTrP. Sweety Charles Carvalho, *et al.* (2014) [9] demonstrated 86% reduction in NDI score in PRT+TENS. Ghiasi *et al.* [23] reported 30% reduction in NDI score. But we found out in our study only 55% reduction in NDI score. PRT involves passive body positioning, which is claimed to elicit immediate and prolonged reductions in tenderness at trigger points and to reduce pain and with musculoskeletal conditions. PRT is an effective method for relieving pain in upper trapezius muscle. Difference in improvement in NDI score was seen better in PRT group as compared to MET group.

Range of Motion

Richa Mahajan [4] reported increase of 18.4% of ROM with MET. We observed increase of 3-11% increase in ROM.

Results of the present study for MET group for improvement in ROM were similar to previous studies of Nagrale AV, Cassidy JD, [27, 28] conducted over neck area. Cassidy et al found immediate increase in ROM of neck in all three planes in patients with mechanical neck pain who were mobilized using MET. Schenk et al found that the group treated with MET demonstrated increased range in each of the six directions of motion. Denise et al reported that MET produced a significant increase in overall regional cervical ROM in the treatment group. [28, 29] The effects of MET component for increase in ROM post intervention can be explained on the basis of physiological mechanisms behind the changes in muscle extensibility - reflex relaxation, viscoelastic change, and changes to stretch tolerance. Reflex muscle relaxation following contraction that has been proposed to occur by activation of the golgi tendon organs and their inhibitory influence on the α -motor neuron pool. In our study ROM was increased by 5-16% in PRT+TENS group, we cannot find any study of PRT which shows improvement in ROM. The influence of PRT on trapezius latent MTPs in this study was consistent with findings of some previous studies of Gemmell H, Aguilera FJ and Fernández-de-las-Peñas C *et al.* [31, 32] The difference in the improvement of ROM was seen better in PRT+TENS group as compared to MET+TENS group.

MMT

MET improves MMT values by 16%, 12%, 16% and 11.08% in Flexors, Extensors, Lateral flexors and Rotators, respectively, $P < 0.0001$. PRT improves MMT values by 21.44%, 18%, 18.87% and 18.71% in Flexors, Extensors, Lateral flexors and Rotators, respectively. $P < 0.0001$. Difference in MMT was considered to be extremely statistically significant. Both the treatment was effective and Group B is superior to Group A. P value less than 0.05 was considered significant by Paired and Unpaired test.

Role of TENS

In our study both the group received TENS, TENS itself can decrease pain and NDI score.

Concentrations of β endorphins increase in the bloodstream and cerebrospinal fluid of healthy patients following administration of either high- or low-frequency TENS.

Muscle Energy Technique

The possible mechanism for the reduction in pain intensity in the MET group can be attributed to the hypoalgesic effects of MET. This can be explained by the inhibitory Golgi tendon reflex, activated during the isometric contraction that leads to reflex relaxation of the muscle.

Positional Release Technique

Jones proposed that when a muscle is strained by a sudden unexpected force, its antagonist attempts to stabilize the joint, resulting in a counterstrain of the muscle in a resting or shortened position. The prevailing theory underlying PRT involves placing tissues in a relaxed shortened state, or POC, for a period of time (≈ 90 s) to decrease gamma gain in order to facilitate restoration of normal tissue length and tension [59, 60].

Validity and consistency of the Instruments

Visual analog scale validity in our study was Pearson, $r = 0.94$, $p =$ less than 0.01, reliability data for interclass coefficient

Pearson was $r=0.91$, $p<0.01$, VAS score showed a good internal consistency Cronbach's $\alpha=0.83$, $p<0.01$ and construct validity of VAS score was 0.92 , $p<0.01$.

Neck Disability Index Scale validity in our study was Pearson, $r=0.89$, $p<0.01$, reliability data for interclass coefficient Pearson was $r=0.86$, $p<0.01$, NDI scale showed a good internal consistency Cronbach's $\alpha=0.75$, $p<0.01$ and construct validity of NDI scale was 0.75 , $p<0.01$.

Positive points of the study

Duration of the treatment was adequate. Study design was very scientifically crafted and randomization was used to decrease physiotherapist bias. Both subjective and Objective assessment of pain (using VAS) and disability (using NDI) with ROM and MMT was done.

Further recommendations

1. Another study with similar methodology but with a large sample size can be planned.
2. We used TENS used in both the group, a future study can be done removing confounding factor like TENS to found out the actual or absolute effect of Muscle energy technique or Positional release technique.
3. Effectiveness of both the technique can be correlated with duration of neck spasm.
4. Other instruments can be used apart from Visual Analogue Scale, Neck Disability Index, Goniometer can be used.

Conclusion

1. There is statistical significant difference between Muscle Energy Technique (MET) and Positional Release Technique (PRT) in relieving pain, function, range of motion and muscle power in computer workers with upper trapezius muscle spasm.
2. Group B (Positional Release Technique) showed earlier pain relief as compared to group A (Muscle Energy Technique). So, if patient requires prompt pain relief positional release technique is the best treatment which can be offered by Physiotherapist.
3. Improvement in ROM and MMT was also observed in both the groups but between two groups, group B (Positional Release Technique) results were statistically significant as compared to group A. This finding suggest that clinical improvement and subjective and objective benefit was also seen.

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Conflict of Interest: NIL

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