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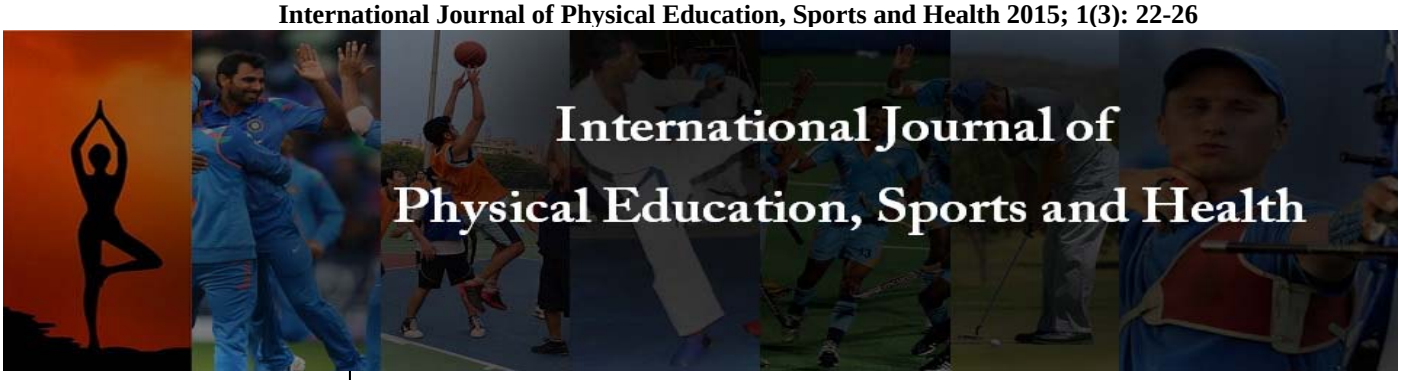

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Effectiveness of Muscle energy technique, Ischaemic compression and Strain counterstrain on Upper Trapezius Trigger Points: A comparative study

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Abstract
The aim of this study is to compare the effectiveness of Muscle energy technique, Ischaemic compression, Strain counter strain with conventional therapy on upper trapezius trigger points in patients with mechanical neck pain. A total of 45 subjects divided into three groups include both male and female with unilateral upper trapezius trigger points were selected, Group A was given muscle energy technique, Group B ischaemic compression, and Group C strain counter strain technique along with conventional physical therapy. All the participants underwent three outcome measures pre and post intervention which included a Visual analogue scale (VAS) for pain, cervical lateral flexion range of motion (CROM) and neck disability index (NDI). The obtained results demonstrated a significant difference exist among the groups after 4th week ($p<0.05$). This study concludes that Muscle energy technique is superior in the treatment of upper trapezius trigger points.

Keywords: Upper trapezius, Trigger points, Muscle energy technique, Ischaemic compression therapy, strain Counter strain technique.

1. Introduction
Mechanical neck pain affects 45% and 54% of the general population at some time or the other in their life and can result in severe disability. [1] Fernandez-de-las-penas et al, found a relationship between the presence of muscle Trigger points in upper fibres of trapezius muscle and the presence of cervical impairment [2]. A myofascial trigger point (MTrP) is a hyperirritable spots, located within a taut band of skeletal muscle that is painful on compression or on stretch and that can give rise to a typical motor, sensory and autonomic components. Motor aspects included disturbed motor function, muscle weakness, muscle stiffness and restricted range of motion. Sensory aspects include local tenderness, referral of pain and peripheral and central sensitization [3].
Currently a large variety of both manual and non-manual interventions exist for inactivation of TrPs. Non manual interventions include botulinum toxin injections, dry needling, acupuncture, spray and stretch techniques and physical modalities like TENS and ultrasound. Manual interventions include Muscle energy techniques, Strain Counterstrain, manual pressure release, proprioceptive neuromuscular facilitation and ischaemic compression [4].
Many studies have proved that combination of M.E.T's , Ischaemic compression and strain counter strain has improved pain in trigger point of upper trapezius but few studies have proved which one of the above three techniques is highly effective in improving pain and cervical range of motion. This study compares the effectiveness of these three techniques in upper trapezius trigger point.

2. Materials and Methods
The study consists of 45 subjects who met the inclusion criteria and were randomly divided into three groups with each group consisting of 15 patients after obtaining their consent. TrPs are identified either through a flat palpation technique or pincer palpation. After the baseline examination was completed, the subjects were randomized to receive either MET with tens, Ischaemic compression with tens or Strain counterstrain with tens.
Application of TENS: The negative electrode of the TENS unit was placed on the MTrp of the upper trapezius muscle and the positive electrode on the acromion tendon insertional site of the muscle.

The current was applied at a pulse repetition frequency of 100Hz and duty cycle of 250s; the intensity was set at a level that each subject should feel but that was not strong enough to induce muscle contraction. The current was applied for 20 minutes [5].

Group A (Ischemic compression) In this technique, the therapist will utilize a pincer grasp, placing the thumb and index finger over the active Trp. Pressure will be maintained until a release of the tissue barrier will be felt. The pressure will be applied in an intermittent manner initially and then continuously for 90 seconds according to patients tolerability. [4]

Group B (Strain counter-strain) the position of ease will be produced through positioning the muscle in a shortened/relaxed position. Ease will be defined as the point where a reduction in pain of at least 70% will be produced. Patient will be in supine lying while the practitioner will position the ipsilateral arm in flexion, abduction and external rotation to reduce the reported Trp pain. Once the position of ease will be identified, pressure is applied to the Trp and it will be held for 20-30s and repeated for three to five times [4].

Group C (MET) in this technique, the subjects were placed supine and the practitioner stabilized the shoulder on the affected side with one hand, while the ear/mastoid area of the affected side was held by the opposite hand. The head and neck were then bent towards the contralateral side, flexed and ipsilaterally rotated. The subjects then shrugged the stabilized shoulder towards the ear at a sub maximal pain-free effort (20% of the available strength). The isometric contraction was held for 7-10s. This position will be maintained for 30 seconds and repeated three to five times per treatment session [4].

All the participants received treatment three times a week for 4 consecutive weeks. Three outcome measures, Visual analogue scale (VAS), cervical lateral flexion range of motion (CROM) and neck disability index (NDI), were taken pre and post the intervention.

3. Results & Discussion

Friedmans test was performed to compare differences within group's i.e., pre intervention, post 2 weeks and 4 weeks. Kriskall Wallis test was performed to compare differences in pre, post 2 week and post 4 week values between the three groups. For all tests, statistical significance was set at $P < 0.05$.

3.1 Tables and Charts

Table 1: VAS scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Group		N	Minimum	Maximum	Mean	Std. Deviation	Kruskal-Wallis Test Mean Rank
Group A	V_pre	15	5.00	8.00	6.3333	1.11270	23.20
	V_Post_2w	15	3.00	6.00	4.4667	.91548	27.27
	V_Post_4w	15	1.00	3.00	1.9333	.70373	25.77
Group B	V_pre	15	5.00	8.00	6.2000	1.14642	21.53
	V_Post_2w	15	3.00	6.00	4.4667	.83381	27.30
	V_Post_4w	15	1.00	3.00	2.0667	.70373	27.83
Group C	V_pre	15	5.00	9.00	6.4667	1.24595	24.27
	V_Post_2w	15	3.00	5.00	3.5333	.74322	14.43
	V_Post_4w	15	.00	3.00	1.2000	.86189	15.40

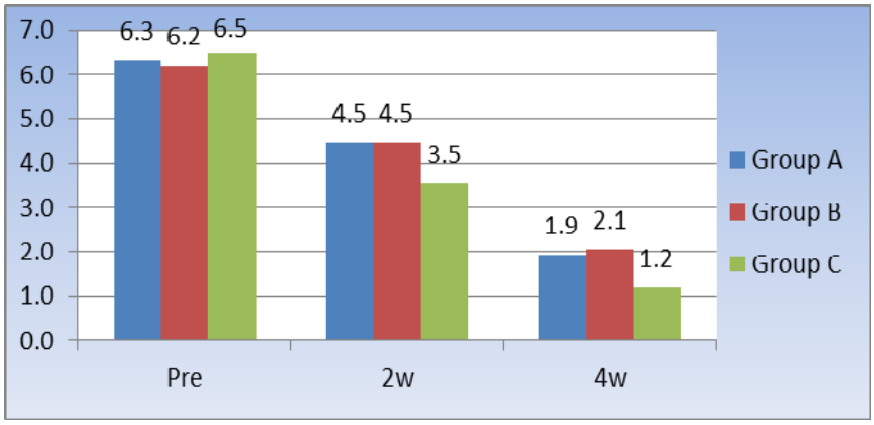

Chart 1: VAS scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Table 1.1: VAS scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Test Statistics[a,b]			
	V_pre	V_Post_2w	V_Post_4w
Chi-Square	.354	10.610	8.806
df	2	2	2
Asymp. Sig.	.838	.005	.012

As can be seen from the output, no significant difference exist among Group A, B and C of Pre VAS, but a significant difference exist among Group A , B and C of 2nd Week post of VAS,4th week post of VAS at a p- value less than 0.05.

Table 2: CROM scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

		N	Mean	Std. Deviation	Std. Error	Kruskal-Wallis Test Mean rank
C pre	Group A	15	25.8667	7.59574	1.96121	22.33
	Group B	15	26.6667	7.48013	1.93136	18.23
	Group C	15	26.0000	7.83764	2.02367	17.33
	Total	45	26.1778	7.47204	1.11387	
C_Post_2w	Group A	15	32.0667	5.59932	1.44574	23.80
	Group B	15	33.0667	6.19293	1.59901	21.07
	Group C	15	37.1333	2.99682	.77378	21.60
	Total	45	34.0889	5.47234	.81577	
C_Post_4w	Group A	15	36.8667	3.75817	.97035	22.87
	Group B	15	37.8667	4.40562	1.13753	29.70
	Group C	15	40.6000	2.38447	.61567	30.07
	Total	45	38.4444	3.87624	.57784	

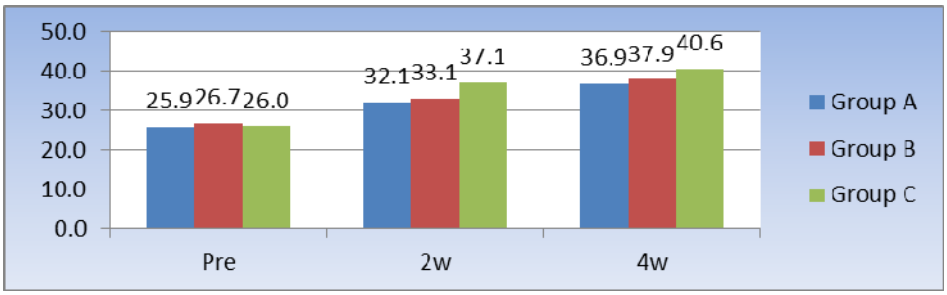

Chart 2: CROM scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Table 2.1: CROM scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Test Statistics			
	C_pre	C_Post_2w	C_Post_4w
Chi-Square	.100	6.464	7.616
df	2	2	2
Asymp. Sig.	.951	.039	.022

As can be seen from the output, no significant difference exist among Group A, B and C of Pre of CROM, but a significant difference exist among Group A , B and C of 2nd Week post of CROM, 4th week post of CROM at p- value less than 0.05.

Table 3: NDI scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

		N	Mean	Std. Deviation	Std. Error	Kruskal-Wallis Test Mean rank
N_pre	Group A	15	18.9333	3.76955	.97329	23.07
	Group B	15	18.1333	3.96172	1.02291	27.83
	Group C	15	19.4667	2.97289	.76760	29.23
	Total	45	18.8444	3.55448	.52987	
N_Post_2w	Group A	15	13.3333	3.67747	.94952	21.13
	Group B	15	12.9333	3.76955	.97329	26.00
	Group C	15	9.7333	2.37447	.61308	24.53
	Total	45	12.0000	3.64318	.54309	
N_Post_4w	Group A	15	8.4000	2.41424	.62335	24.80
	Group B	15	7.4667	2.44560	.63145	15.17
	Group C	15	5.6000	2.02837	.52372	15.23
	Total	45	7.1556	2.54018	.37867	

Chart 3: NDI scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Table 3.1: NDI scores of Groups A, B, C, pre, post 2nd wk, post 4th week.

Test Statistics			
	N_pre	**N_Post_2w**	**N_Post_4w**
Chi-Square	.603	8.385	9.370
Df	2	2	2
Asymp. Sig.	.740	.015	.009

As can be seen from the output, no significant difference exist among Group A, B and C of Pre of NDI, but a significant difference exist among Group A , B and C of 2nd Week post of NDI, 4th Week post of NDI at a p- value less than 0.05.

4. Discussion

The upper trapezius plays an important role in the mobility and stability of neck. The symptoms seen in people with latent MTrp could be explained by the energy crisis theory (Simons et al., 1999). According to this theory, a sustained contractile activity of sarcomeres increases the metabolic demands and squeezes the rich capillaries networks that supply the nutritional and oxygen needs of that region and decreased blood flow in the muscle at the site of latent trigger point (Zhang et al., 2008). The combination of increased metabolic demand and impaired metabolic supply produces a local energy crisis. The local hypoxia and tissue energy crisis stimulates production of vasoreactive substances which will sensitize local nociceptors causing pain. In the presence of latent MTrp muscle could undergo early fatigue (Hagberg and Kvarnstrom., 1984) and put excessive stress on other stabilizing structures. [3] Graff-Radford suggested that the pathogenesis of myofascial pain likely has a central mechanism with peripheral clinical manifestations. Therefore, therapy for myofascial pain should involve enhancing the central inhibition. [6]

When ischaemic compression is used on the trigger points, local chemistry changes due to blanching of the nodules followed by hyperaemia when compression is released. This flushes out the muscle inflammatory exudates and pain metabolites, breaks down the scar tissue, desensitizes the nerve endings and reduces the muscle tone. [7]

Strain counter strain is thought to achieve its benefits by means of an automatic resetting of muscle spindles which would help to dictate the length and tone into the affected tissues (Chaitow, 2001; Jones 1981). The ischaemic compression technique is usually applied with the targeted muscle in the lengthened position and is used to treat MTrp. In contrast, the strain counter strain technique is usually applied with the targeted muscle in shortened position and is used to treat tender points. [8]

The possible mechanism for the reduction in pain in the MET group can be attributed to the hypoalgesic effects which can be explained by the inhibitory Golgi tendon reflex, activated during the isometric contraction that leads to reflex relaxation of the muscle. Activation of muscle and joint mechanoreceptors leads to sympathoexcitation evoked by somatic efferents and localized activation of the preaqueductal gray matter that plays a role in descending modulation of pain. The effects of MET for increase in range of motion can be explained on the basis of physiological mechanisms behind the changes in muscle extensibility – reflex relaxation, viscoelastic change and changes to stretch changes. Combination of contractions and stretches (as used in METS) might be more effective for producing viscoelastic change than passive stretching alone, because the greater forces could produce increased viscoelastic change and passive stretching. [9]

Muscle energy techniques, i.e., post isometric relaxations are commonly recommended in the management of MTrps (Lewit, 1999). Lewit and Simons (1984) found an immediate relief of pain and tenderness after treatment with post isometric relaxation in patients with musculoskeletal dysfunction. Goldenberg (1993) found decreased pain intensity in tender points in patients suffering from fibromyalgia following the application of MET. Schenk et al has proved in his study the effect of MET on CROM. [10]

The difference in effect between IC and MET can be explained as IC shows immediate effect in pressure pain threshold (PPT) during 1 week whereas MET has its effects not only on PPT over time but also in pressure pain perception (PPP) in the immediate. This can be correlated with previous studies of upper trapezius Trp, Nagrale et al have shown improvement in PPP after 4 weeks of MET[7] and Nambi et al compared the effects of MET and IC on upper trapezius Trp and proved MET to be more effective. [11]

5. Conclusion

A 4 week intervention of Ischaemic compression, Strain counterstrain and Muscle energy technique has showed that the three techniques were effective in the treatment of upper trapezius trigger points however significant difference was found in the Muscle energy technique group. So this study concludes that Muscle energy technique is superior to ischaemic compression and strain counterstrain techniques in the treatment of upper trapezius trigger points.

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