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Effect of muscle energy technique versus middle and lower trapezius strengthening exercises on pain and neck functions in subjects with upper trapezitis

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Abstract
Trapezitis is an inflammatory pain causing a severe neck spasm. Trapezius pain is a classic stress pain and it is the most common musculoskeletal disorder. The upper trapezius muscle is designated as postural muscle and it is highly susceptible to overuse. The aim of this study is to compare the effectiveness of muscle energy technique and strengthening of middle and lower trapezius on pain and neck function in subjects with upper trapezitis. 50 subjects with upper trapezitis between the age group of 20 to 50 were randomized into two groups. Subjects were screened initially and those fulfulling the inclusion and exclusion criteria, both male and female were included in the study. Group A (n=25) received 3 to 5 repetitions of Muscle Energy Technique while Group B (n=25) were administered middle and lower trapezius strengthening exercises for 8 sessions on alternative days for a duration of 2 weeks. Pre-and Post-assessment of pain and function were measured at baseline and after 8 sessions for both the groups by using VAS (Visual Analogue Scale) and NDI (Neck disability index) score. There was statistically significant difference (p<0.05) showing improvement in mean of VAS and NDI before and after intervention within groups and there was statistically no significant difference when the post intervention means were compared between the groups. The study concluded that both MET and strengthening of Middle and Lower trapezius were found to be significantly effective in reducing pain and improving neck functions in subjects with upper trapezitis.

Keywords: Upper trapezitis, visual analogue scale, neck disability index

Introduction
Neck pain is the most common traumatic and non-traumatic musculoskeletal pain.[1] About two-thirds of the general population suffer from neck pain at some point of time in their lives, with the prevalence being the highest in middle age [2]. Majority of them present with "non-specific neck pain", occurring from bad postural habits or due to mechanical causes. Mechanical neck pain has a lifetime prevalence of 45—54% in the general population [3-5] and up to 30% of men and 50% of women experience neck pain in the course of a lifetime [6]. The point prevalence of neck pain has been estimated to be between 13.4 and 22.2%.[7] Further, 14% of patients are at risk of their neck pain becoming chronic which makes neck pain expensive in terms of absenteeism from work and in healthcare costs [8].

Trapezius is a diamond shaped muscle comprising of three parts (FIBERS): the upper, middle and lower portions. It forms the slope of the shoulder as it originates from the external occipital protuberance and from the spines of C7 to T12 vertebrae and inserts onto the lateral thirds of the clavicles and acromion processes of the scapulae. The accessory nerve (CN 11) and the cervical nerve roots (C1 to C4) innervates it.

Trapezitis is a condition characterized by the inflammation of upper, middle and lower fibers of the trapezius muscle. Patients with neck or shoulder pains often present with symptoms in the region of upper trapezius. Headaches, dizziness, neck pain and mid-back pain are the most common symptoms associated with tightness of this muscle [9, 10].

Upper trapezius is a postural muscle and it is highly susceptible to overuse. In Trapezitis, one experiences continuous pain throughout, which is aggravated by activity and it may also be referred to other areas from the primary site of inflammation. Passive range of motion may be painful and restricted due do pain and protective spasm in agonistics group of muscle.

Recent studies have hypothecated the pathogenesis of Trapezitis that, it results from over loading and injury to the muscle leading to involuntary shortening of localized fibers [10].

Various authors have also proposed that middle and lower trapezius weakness may occur due to prolonged tightness or over activity of the upper trapezius muscle, resulting in postural adaptations and pain. The area of stressed soft tissue receive less oxygen, glucose hence subsequently accumulates high level of metabolic waste product the end result of this event is the development of trigger point [11].

Muscle Energy Technique (MET) is a manipulative procedure that is designed to lengthen muscle and fascia and to mobilize joints. [12] It can be used to reduce pain, stretch the tight muscles and fascia, reduce muscle tonus, improve local blood circulation, strengthen weak musculature and mobilize the hypomobile joints and hence restore proper biomechanical and physiological function of the joints [11]. MET is commonly used for treating active trigger points in upper trapezius and has proved to be effective in treatment of trapezius spasm [13].

Muscle strength is the ability of the muscle group to develop maximal contractile force against a resistance in single contraction [14]. Muscle imbalances are impaired relationships between muscles prone to tightness that lose extensibility (overactive), and those prone to inhibition and weakness (underactive) [15].

Prolonged tightness or over-activity of the upper trapezius muscle leads to middle and lower trapezius muscle weakness, resulting in postural adaptations and pain [16]. However, individuals with neck pain have limited strength and endurance of the lower trapezius muscle [17]. Exercises that enhance the ratio of lower trapezius to upper trapezius strength tend to reduce this muscle imbalance and improve the symptoms [18]. Hence, Strengthening middle and lower trapezius is an important part of workout.

Upper Trapezitis is one of the most common problem seen in middle aged people. It becomes important to establish proper treatment regimens towards better patient care. Hence, there is a need to derive effective treatment procedures. There is a paucity of evidence comparing the effectiveness of MET (upper trapezius) over strengthening exercises (for middle and lower trapezius) in subjects with upper trapezitis. Hence, there exists the purpose for the study.

Methodology

Study Design: Randomized Controlled Trial
Sample Size: 50

Sample and sampling technique

Sample size of n =25 was determined through power calculation based on prevalence rate of p=13% for upper trapezitis obtained from previous studies. With level of significance α = 0.05, d = 0.2, $Z^2_{\alpha/2}$ = 1.96,

substituting in the formula,

$$n=\frac{Z^2_{\alpha/2} \cdot p \cdot q}{d^2}$$

where, n = the sample size
Z = critical value at 95% confidence interval
P = percentage of population
q = 1-p
d = margin of error

Sample consisted of 50 subjects, 25 in each group aged 20-50 years, fitting into inclusion and exclusion criteria and sampling was done by simple random sampling method using a Random Number Generator application.

Procedure

Ethical clearance was obtained from the ethical committee of R.V. College of Physiotherapy and Dr. Ananda Murthy's Orthopedic Clinic. All the subjects fulfilling the inclusion and exclusion criteria was informed about the study and a written consent was taken. Subjects who met the eligibility criteria were assigned into two groups based on simple random sampling randomization using a Random Number Generator application. Group A received MET and Group B was administered middle and lower trapezius strengthening exercises for a period of 2 weeks on alternative days with 8 sessions.

Pre intervention evaluation

Intensity of Pain using Visual Analog Scale (VAS) – subjects were asked to indicate on the line where the pain is in relation to the two extremes "no pain" and "worst possible pain". Measure from the left hand side to the mark. Total scores range from 0 to 10 with a higher score indicating more severe pain.

Neck Disability Index (NDI) scoring- subjects were asked to mark their ability to perform each of the 10 activities before starting the treatment. It is a standard instrument for measuring self-rated disability due to neck pain. It consists of 10 items each of them is scored from 0-5.Thus the maximum score is 50.

Group A: (Muscle energy technique)

In this technique, the subjects were placed supine and the therapist stabilised 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 was then bent towards the contralateral side, flexed and ipsilaterally rotated. The subjects were asked to shrug 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 was maintained for 30 seconds and repeated three to five times per treatment session Duration of the treatment was for two weeks on alternative days (eight sessions).

Group B: (Strengthening exercises for middle and lower trapezius)

1. Exercise to strengthen the middle and lower trapezius muscles using a short lever arm for resistance. The subjects were asked to contract the middle and lower trapezius muscles, focusing on quality and control of activation without the compensatory use of the upper trapezius and posterior deltoid muscles. The subjects were asked to lift the elbows toward the ceiling.
2. Exercise to strengthen the middle trapezius muscle using a longer lever arm for resistance. The subjects were asked to contract the middle trapezius muscle, focusing on quality and control of the activation without compensatory use of the upper trapezius and posterior deltoid muscles. The wrists stay in a neutral position, and the scapulae are brought into retraction as the arms will

be lifted toward the ceiling.

3. Exercise to strengthen the middle trapezius muscle using a long lever arm for resistance. The subjects were asked to contract the middle trapezius muscle, focusing on quality and control of the activation without the compensatory use of the upper trapezius and posterior deltoid muscles. With the elbows straight, the subject retracts and adducts the scapulae, lifting the arms toward the ceiling.
4. Wall-slide exercise to strengthen the middle and lower trapezius in a functional overhead position. The subjects were asked to bring their back against the wall. Shoulders will be in 90° of external rotation at 90° of abduction. The subjects contracted the middle and lower trapezius, focusing on quality and control of activation without compensation of the upper trapezius. Subject simultaneously slides the hands up the wall as far as they can, while keeping their back, elbows, and wrists against the wall.

Dosage: Three sets of ten repetitions twice a day for two weeks duration on alternative days (eight sessions).
At the completion of eight treatment sessions, outcome measures were re-evaluated and pre and post scores was compared and the data was used for statistical analysis.

Results

Statistical Analysis: Randomized controlled trial was used to compare the effectiveness of muscle energy technique and strengthening of lower and middle trapezius in upper trapezitis. Descriptive and inferential statistical analysis has been carried out in the present study. In descriptive statistics, all categorical variables are presented with frequency, percentage and graphical representations. The quantitative variables are presented by computing Mean ± SD (Min-Max).
Unpaired t-test has been used to find the significance of the study parameters between the groups.
While paired t-test has been used to find the significance within the groups
The Statistical software namely SPSS 16.0 was used for the analysis of the data and Microsoft word 2013 and Microsoft Excel 2013 have been used to generate graphs and tables.

Table 1: Sex distribution

Gender	Group A	Group B	Total
Female	16(64%)	18(72%)	34(68%)
Male	9(36%)	7(28%)	16(32%)
Total	25(100%)	25(100%)	50(100%)

Table 2: Age Distribution

Age in years	Group A	Group B	Total
20-29	10 (40%)	8 (32%)	18 (36%)
30-39	10 (40%)	10 (40%)	20 (40%)
40-49	5 (20%)	7 (28%)	12 (24%)
Total	25 (100%)	25 (100%)	50(100%)
Mean ± SD	32 ±8.65	33.4±8.04	32.7±8.29

Table 3: Comparative assessment for Pre and Post NDI and VAS score

	Pre test	Post test	difference	t value	P value
NDI score					
Group A	12.4±4.53	3.52±2.40	8.88	12.34	<0.001**
Group B	12.6±4.60	3.44±2.16	9.16	12.47	<0.001**
P value	-	0.45	-	-	-
VAS score					
Group A	6.80±0.81	1.52±0.77	5.28	31.33	<0.001**
Group B	6.76±0.87	1.56±0.76	5.20	31.84	<0.001**
P value	-	0.43	-	-	-

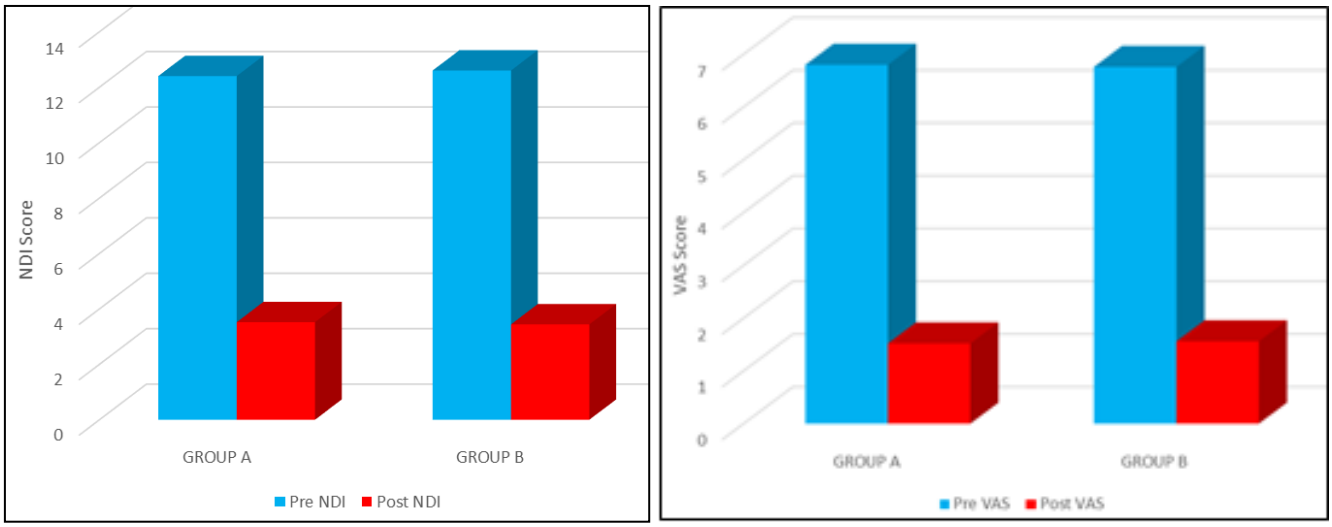

Fig 1: Comparison of pre and post intervention ODI and VAS score within the groups

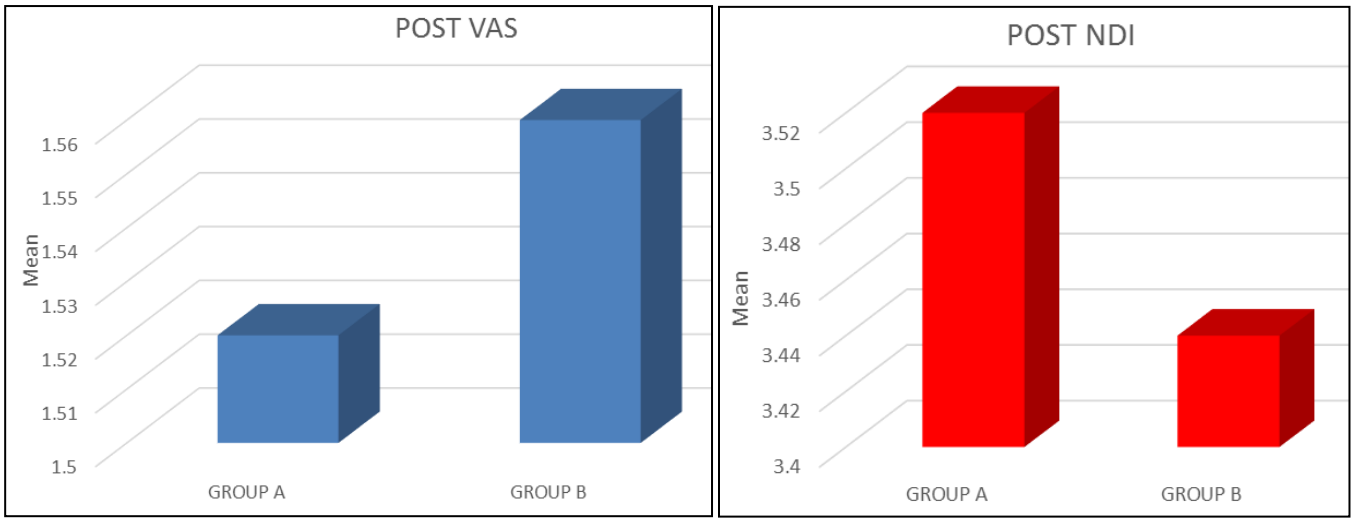

Fig 2: Comparison of post intervention mean of NDI and VAS score between the groups

Discussion

Neck pain has become one of the major factor influencing lifestyle which adversely affects the quality of life these days among which one of the leading cause is found out to be associated with upper trapezitis. Various researches and studies have found out that overuse of upper trapezius and under activity of middle and lower trapezius is a major cause of upper trapezitis following which musculoskeletal structures at different levels are being compromised.

The upper trapezius plays an important role in the mobility and stability of neck. Passive range of motion may be painful and restricted due do pain and protective spasm in agonistics group of muscle. Trapezitis results from over loading and injury of muscle tissue leading to involuntary shortening of localized fiber.

This study showed reduction in the pain following MET that can be explained on the basis of inhibitory effects of Golgi Tendon Organ (which causes a dampening effect on the motor neuronal discharges, thereby causing relaxation of the musculotendinous unit by resetting its resting length). These reflexes will allow relaxation in musculotendinous unit tension and decreased pain perception. MET is effective for mobilizing restricted joints, relaxing hypertonic and spastic muscle as well as facilitating neuromuscular reorganization. It is an appropriate technique for patient whose symptoms are aggravated by certain posture or bodily position.

Lewit and Simons *et al*. found an immediate relief of pain and tenderness after treatment with post isometric relaxation in patient with musculoskeletal dysfunction.

Muscle-strengthening exercises for the middle and lower trapezius have a positive impact on upper trapezitis by reducing the over activity of upper trapezius and thus decreasing the pain in upper trapezius.

The present study found that eight sessions of MET and strengthening of middle and lower trapezius are equally effective in improving pain and neck functions in subjects with upper trapezitis in a duration of two weeks on alternative days.

Conclusion

The study was intended to compare the effectiveness of MET and strengthening of middle and lower trapezius on pain and neck functions in subjects with upper trapezitis. Both the groups showed statistical significance of $P<0.001$ within the groups compared to pre and post-test. Post test score between the groups showed no significance of P=0.45 in NDI scale and P=0.43 in VAS scale. The study concluded that both the intervention techniques are equally effective for reducing pain and improving neck functions in subjects with upper trapezitis.

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