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Effectiveness of Muscle Energy Technique versus Myofacial Release Technique Along with Ultrasound on Cervical Pain, Range of Motion and Neck Disability in Patients with Upper Trapezitis - A Comparative Study

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Abstract: ***Introduction: Trapezitis is inflammation of trapezius muscle. Trapezius pain is the 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. This study investigated two different types of technique that have been proposed as an adjunct to conventional therapy to treat trapezitis. Methodology: Purposive samples of 44 upper trapezitis subjects aged 20-50 were included & divided into two equal group of 22 subjects each. Group A treated with muscle energy technique, Group B treated with myofascial release technique. Cervical range limitation was measured by using universal full circle goniometer and also NPRS for pain and NDI for disability were calculated pre and post intervention. Results: Muscle energy technique and Myofascial release technique was effective among which Muscle energy technique was more effective in increasing cervical range of motion neck flexion (mean-75.91, p=0.0003, neck extension (mean- 65.41, p=0.0003) side flexion right side (mean-38.32, p=0.0002), side flexion left side (mean-39.32, p=0.001), decreasing pain (mean-1.36, p=0.03) and decreasing neck disability (mean-8.32, p=0.0001). Conclusion: Muscle Energy Technique & Myofascial Release technique were both found to be effective but muscle energy technique is more effective therapeutic manoeuver.***

Keywords: NPRS (Numerical pain rating scale), NDI (Neck disability index), MET (Muscle Energy Technique), MFR (myofascial release), ROM (Range of Motion), Trapezitis

1. Introduction

The trapezius muscle is an inverted triangle starts at the base of the occipital bone, spreads over the shoulders and down to the mid back. The trapezius muscle is divided into three areas upper fibres, middle fibres, lower fibres (1). The trapezius muscle is mainly postural but is also used for active movements such as side bending and turning the head, elevating and depressing the shoulders, and internally rotating the arm. The trapezius elevates, depresses, and retracts the scapula. The descending muscle fibers of the trapezius muscle internally rotate the arms. The transverse muscle fibers retract the scapulae, and the ascending muscle fibres medially rotate the scapulae (2). Inflammation of trapezius muscle is known as Trapezitis. Trapezius pain is the stress pain and is the most common musculoskeletal disorder and is caused by placing too much stress and strain over the trapezius muscle (3)

The upper trapezius muscle is designed as postural muscle and is highly susceptible to overuse (4) Muscle spasm occurs and causes formation of muscle knots called trigger points. These knots form as the muscle gets overloaded due to spasm which keeps the muscle continuously in contracted position. Tightness of the upper trapezius is associated with elevated shoulders or asymmetrical head positions as well as restricted head and neck range of motion. Passive range of motion is restricted due to pain and in antagonist muscle group there is

protective spasm. The prevalence ratio in India of male and female is 1:10 and 3-5% of the population is affected worldwide (5).

Trapezitis is mainly caused due to stress, tension, repetitive movements, forward head posture, sitting without back support, working with no arm support, prolonged head bending activity, using a thick pillow, tight pectoralis major muscle and severe neck spasm. Neck pain is commonly seen in the individuals due to involvement of upper trapezius muscle during lateral flexion (6). Neck pain had become a common complaint in the all-inclusive community with an expected lifetime (7). Physiotherapy interventions for trapezitis include massage, stretching and different modalities like Interferential therapy, Transcutaneous electrical nerve stimulation, Heat, Cryotherapy, Exercise therapy, Positional release therapy and Ultrasound therapy.

Ultrasound therapy, one of the most important physical treatment modalities used for heating superficial and deep tissues has 3 techniques of application- Direct contact, Water bath and Water bag. It has proved to be more effective in relieving pain and has the ability to decrease short term local trigger point sensitivity (3). Frequency of 1MHz is used for a tissue up to 5cm deep and 3MHz for a tissue 1 to 2cm deep (3). Myofascial release (MFR) is an example of manual therapy that has become widely used (8) It is a soft tissue mobilization technique, defined as the facilitation of mechanical, neural and psychophysiological adaptive potential as interfaced via the myofascial system (9). The form of Myofascial release used in this study is a graded stretch to the soft tissue by the clinician that is guided entirely by feedback from the recipient's body to determine stretch direction, force and duration (10,11). The major benefits is reduction of pain associated with tissue restrictions (12)

Muscle Energy Technique (MET) is a form of manipulative treatment using active muscle contraction at varying intensities from precisely controlled position in specific direction against a counter force. The receptors present in muscle react to over stretching of the muscle by inhibiting further muscle contraction and has a lengthening effect due to the sudden relaxation of entire muscle under stretch. There are evidences proving that Muscle Energy Technique over upper trapezius muscle is effective in relieving myofascial pain and improving Range Of Motion of neck in patients with myofascial pain syndrome over upper trapezius muscle and there are evidences proving that Myofascial release technique is also effective (13)

Therefore, the current study was conducted to determine whether the muscular energy technique or myofascial release technique is more effective to the trapezius muscle in both pain relief and neck functional ability in patients with cervical pain (4). Therefore, the purpose of the study is to compare the effect of muscle energy technique versus Myofascial release technique along with Ultrasound on cervical pain and cervical range of motion in patients with upper trapezitis.

2. Material & Methods

Study design: Comparative study

Sampling method: Purposive sampling

Randomization: Simple randomized method

Duration of study: 6 months

Duration of intervention: Five session for one week

Study Center: Musculoskeletal Physiotherapy Department, MIP College of Physiotherapy, Latur.

Materials Used:
1) Treatment Table
2) Pen and paper
3) Chair
4) Scale
5) Universal Goniometer
6) Neck disability index scale
7) NPRS scale
8) Consent form
9) Ultrasound Apparatus

Procedure

Conventional Treatment:
- Ultrasound therapy: Frequency: 1 MHz,
  Intensity: 1.4 W/cm2,
  Time: 5 minutes,
  Mode: Continuous,
- Number of sessions: five session per week
- Trapezius stretching was given to patient

Group A: Muscle Energy Technique
In order to treat all the fibers of upper trapezius, MET was applied sequentially. The upper trapezius was subdivided into anterior, middle and posterior fibers. The patient was lying supine, arm on the side to be treated lying alongside the trunk, head/neck side bent away from the side being treated to just short of the restriction barrier, while the therapist stabilized the shoulder with one hand and cup the ear/mastoid area of the same side of the head with the other.

With the neck fully side bent and fully rotated contralaterally, the posterior fibers of upper trapezius was involved in the contraction. This facilitated subsequent stretching of this aspect of the muscle. With the neck fully side bent and half rotated, the middle fibres will involve in the contraction. With the neck fully side bent and slightly rotated towards the side being treated the anterior fibers of upper trapezius will be treated.

The patient was asked to introduce a light resisted effort to take the stabilized shoulder towards the ear (a shrug movement) and the ear towards the shoulder. The degree of effort should be mild. The contraction was sustained for 10 seconds and upon complete relaxation of effort, the therapist gently ease the head/neck into an increased degree of side bending and rotation, where it was stabilized, as the shoulder will be stretched caudally. Once the muscle is stretched, the

patient was asked to relax and the stretch will be held for 20 seconds.

This procedure was repeated for 3 times. The treatment session was given for 5 days and score were measured and noted on 1st and 5th day.

Group B: Myofascial Release Technique

The patient was seated erect on chair with arms hang freely. Then the tender area was marked with nontoxic marker pen. The practitioner was standing to the side and behind the patient, close to the muscle to be treated. The forearm or lateral aspect of the palm should glide slowly medially towards the base of the neck or scapula, while maintaining a firm pressure. As glide is given the patient equally side bend and turn the head away from the side being treated while maintain erect sitting posture.

Myofascial release was given for 5 minutes including 3 palmar glide. The treatment session was given for 5 days and score were measured and noted on 1st and 5th day.

Criteria for Study

Inclusion criteria:

- Age: 20-50 years
- Gender: male and female
- Unilateral Trapezitis and Bilateral trapezitis
- Subject with trapezius muscle spasm
- Patient willing to participate.

Exclusion criteria:

- Fracture of the cervical spine
- Neck pain with radiation into arms or upper extremity
- Diagnosed cases of disc prolapse
- Any neurological impairment
- Tumour in cervical region
- Any deformity (e.g. spasmodic torticollis, sprengel's deformity)
- History of surgery of the cervical spine during the previous months
- Patients who are taking analgesics

Outcome Measures and Statistical Tool

Outcome measures:

1) NPRS
2) Active cervical ROM
3) Neck disability index

Statistical tool: Paired and unpaired t test

Data Analysis: The Data is analysed using 'Unpaired t-test and Paired t-test'

Statistical Analysis: Descriptive statistical data was presented in the form of mean +/- standard deviation and mean difference percentages was calculated and presented.

'Paired t test' was performed to assess the statistical significant difference within the group for numerical pain rating Scale, neck disability index and cervical ROM

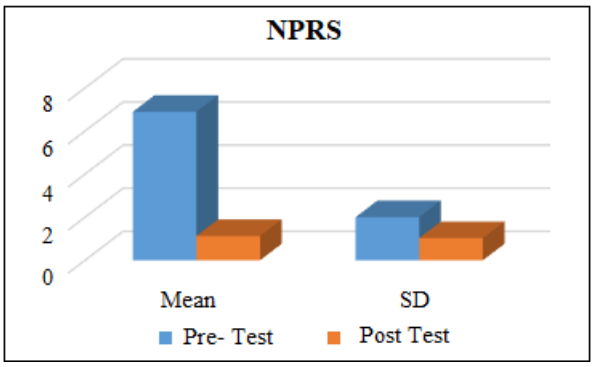
'Unpaired t test' was performed to assess the statistical significant difference between the groups for numerical pain rating scale, neck disability index and cervical ROM.

3. Result

Group A:

Table 1: Analysis of mean score of neck pain in group A Side Flexion Right Side

NPRS	Mean	SD	t-test	P- Value	Significance
Pre Test	6.89	2	15.77	<0.0001	Significant
Post Test	1.13	1.03			

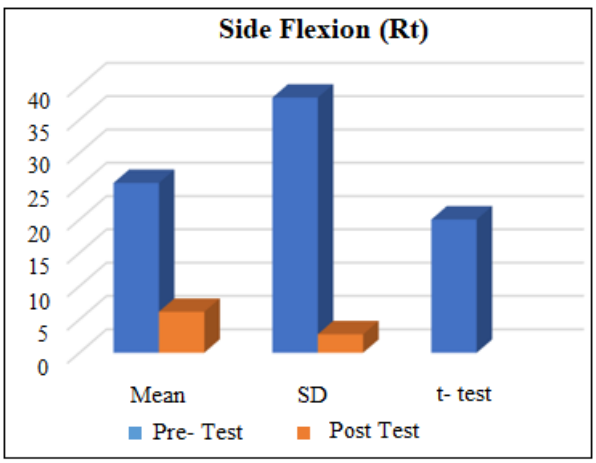


Graph 1

Result: The mean value of pre-test and post-test are 6.89 and 1.13, standard deviation of pre-test and post-test is 2 and 1.03. The T value is 15.77 and p value is <0.0001.

Table 2: Analysis of mean score of neck ROM in group A Side Flexion Right Side

ROM	Mean	SD	t-test	P- Value	Significance
Pre Test	25.5	38.32	20.01	<0.0001	Significant
Post Test	6.15	2.77			

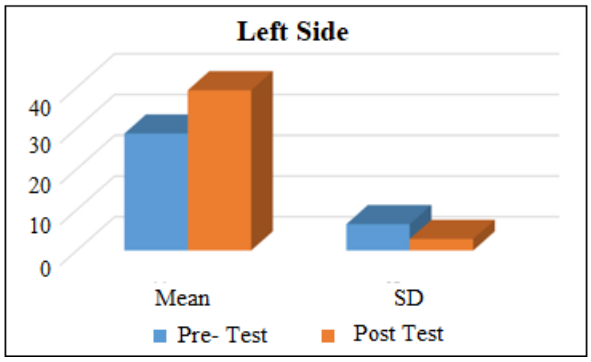


Graph 2

Result: The mean value of pre-test and post-test are 25.5 and 6.15, standard deviation of pre-test and post-test is 38.32 and 2.77. The T value is 20.01 and p value is <0.0001.

Table 3: Analysis of mean score of neck ROM in group A **Side Flexion Left Side**

ROM	Mean	SD	t-test	P- Value	Significance
Pre Test	28.68	6.46	8.56	<0.0001	Significant
Post Test	39.32	2.82			



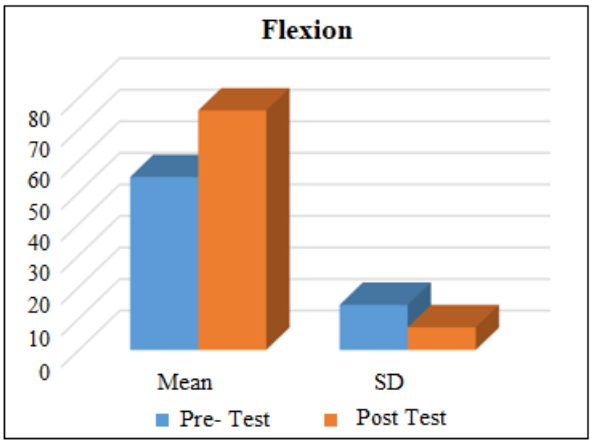
Graph 3

Result: The mean value of pre-test and post-test are 28.68 and 39.32, standard deviation of pre-test and post-test is 6.46 and 2.82. The T value is 8.56 and p value is <0.0001.

Table 4: Analysis of mean score of neck ROM in group A

Cervical Flexion

ROM	Mean	SD	t-test	P- Value	Significance
Pre Test	54.79	14.29	7.74	<0.0001	Significant
Post Test	75.91	7.18			



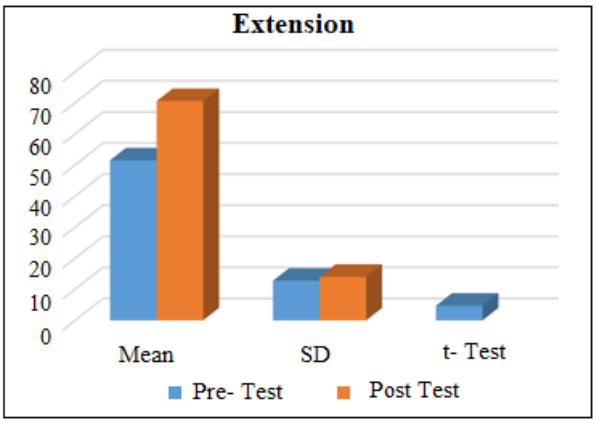
Graph 4

Result: The mean value of pre-test and post-test are 54.79 and 75.91, standard deviation of pre-test and post-test is 14.29 and 7.18. The T value is 7.74 and p value is <0.0001.

Table 5: Analysis of mean score of neck ROM in group A

Cervical Extension

ROM	Mean	SD	t-test	P- Value	Significance
Pre Test	51.5	12.75	4.73	<0.0001	Significant
Post Test	70.56	14			



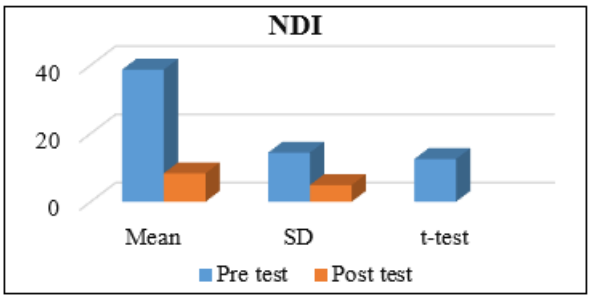
Graph 5

Result: The mean value of pre-test and post-test are 51.5 and 70.56, standard deviation of pre-test and post-test is 12.75 and 14. The T value is 4.73 and p value is <0.0001.

Table 6: Analysis of mean score of Neck Disability Index in group A

NDI

Pain	Mean	SD	t-test	P- Value	Significance
Pre Test	38.68	14.37	12.5	<0.0001	Significant
Post Test	8.32	4.89			



Graph 6

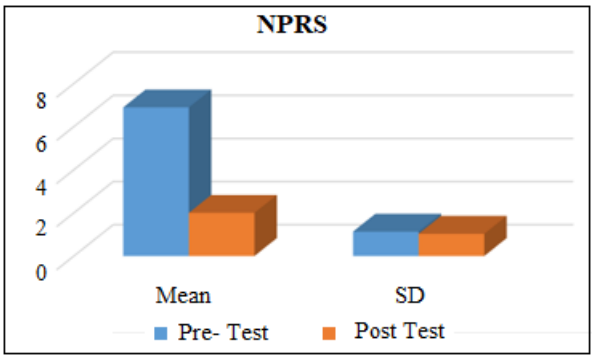
Result: The mean value of pre-test and post-test are 38.68 and 8.32, standard deviation of pre-test and post-test is 14.37 and 4.89. The T value is 12.5 and p value is <0.0001

Group B

Table 7: Analysis of mean score of neck pain in group B

NPRS

Pain	Mean	SD	t-test	P- Value	Significance
Pre Test	6.89	1.13	13.55	<0.0001	Significant
Post Test	2	1.03			



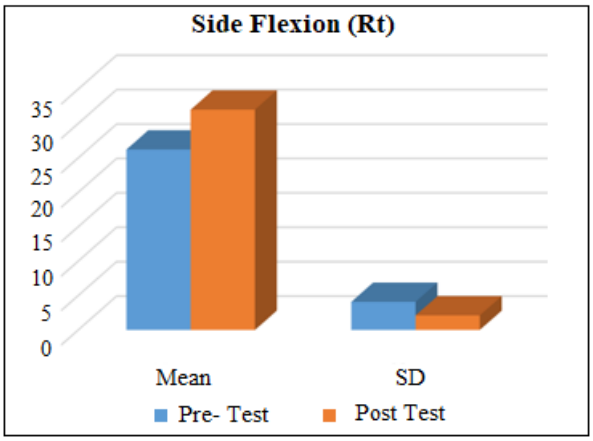
Graph 7

Result: The mean value of pre-test and post-test are 6.89 and 2, standard deviation of pre-test and post-test is 1.13 and 1.03. The T value is 13.55 and p value is <0.0001

Table 8: Analysis of mean score of neck ROM in group B

Side Flexion Right Side

	Mean	SD	t-test	P- Value	Significance
Pre Test	26.22	4.08	8.1	<0.0001	Significant
Post Test	32.01	2.11			



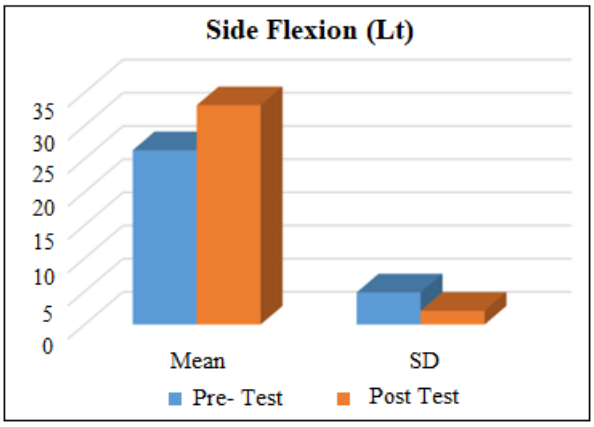
Graph 8

Result: The mean value of pre-test and post-test are 26.22 and 32.01, standard deviation of pre-test and post-test is 4.08 and 2.11. The T value is 8.1 and p value is <0.0001

Table 9: Analysis of mean score of neck ROM in group B

Side Flexion Left Side

	Mean	SD	t-test	P- Value	Significance
Pre Test	26.28	4.84	8.33	<0.0001	Significant
Post Test	33.06	2.06			



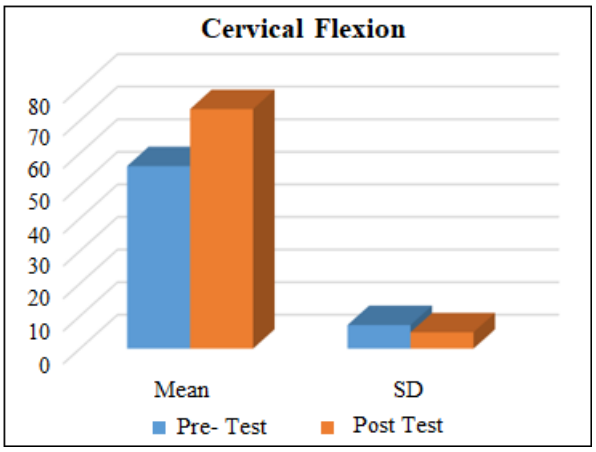
Graph 9

Result: The mean value of pre-test and post-test are 26.28 and 33.06, standard deviation of pre-test and post-test is 4.84 and 2.06. The T value is 8.33 and p value is <0.0001

Table 10: Analysis of mean score of neck ROM in group B

Cervical Flexion

	Mean	SD	t-test	P- Value	Significance
Pre Test	56.06	7.25	8.41	<0.0001	Significant
Post Test	73.56	5.03			



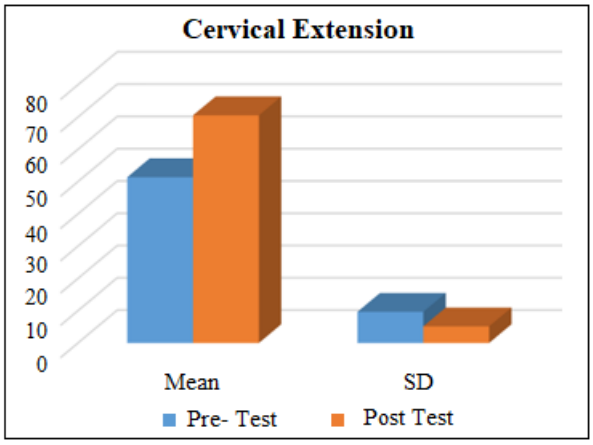
Graph 10

Result: The mean value of pre-test and post-test are 56.06 and 73.56, standard deviation of pre-test and post-test is 7.25 and 5.03. The T value is 8.41 and p value is <0.0001

Table 11: Analysis of mean score of neck ROM in group B

Cervical Extension

	Mean	SD	t-test	P- Value	Significance
Pre Test	51.39	9.67	7.39	<0.0001	Significant
Post Test	70.56	5.16			



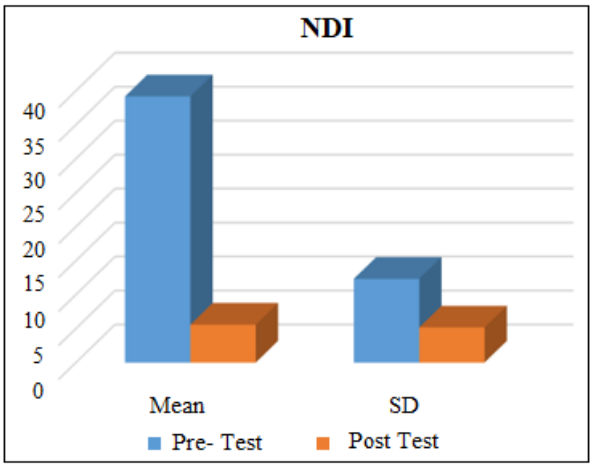
Graph 11

Result: The mean value of pre-test and post-test are 51.39 and 70.56, standard deviation of pre-test and post-test is 9.67 and 5.16. The T value is 7.39 and p value is <0.0001.

Table 12: Analysis of mean score of neck disability in group B

NDI

	Mean	SD	t-test	P- Value	Significance
Pre Test	39.17	12.32	8.77	<0.0001	Significant
Post Test	5.57	5.16			



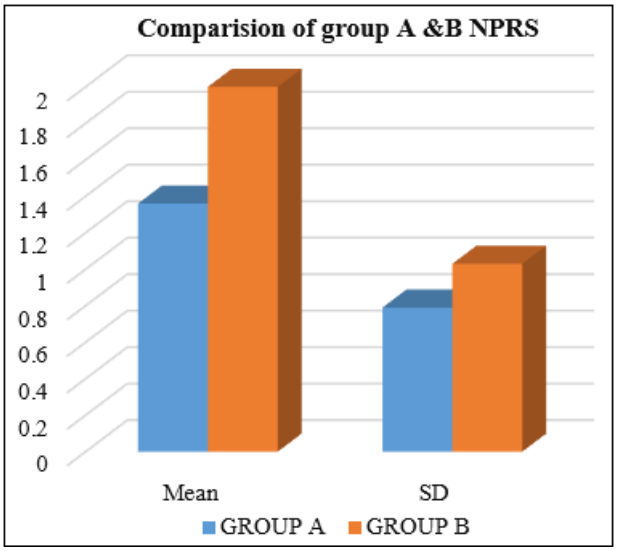
Graph 12

Result: The mean value of pre- test and Post- Tests are 39.17 and 5.57, standard deviation of PRE test and POST test is 12.32 and 5.16. The T value is 8.77 and p value is <0.0001

Numerical Pain Rating Scale

Table 13: Analysis of mean score of neck pain in group A & group B
NPRS

	Mean	SD	t-test	P- Value	Significance
Group A	1.36	0.79	2.21	<0.03	Significant
Group B	2	1.03			



Graph 13: Comparison of group A & group B Numerical Pain Rating Scale

NPRS

	Mean	SD	t-test	P- Value	Significance
Group A	1.36	0.79	2.21	<0.03	Significant
Group B	2	1.03			

Result: The mean value of post- test are 1.36 & 2, standard deviation of post- test is 0.79 & 1.03. The T value is 2.21 and p value is 0.003

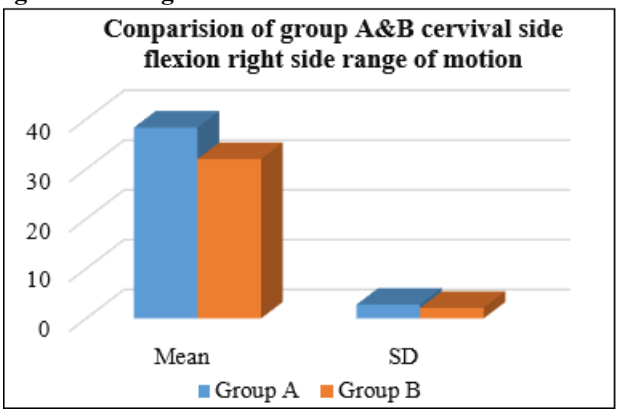
These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique.

Cervical Range of Motion

Table 14 Analysis of mean score of neck ROM in group A & group B
Side Flexion Right Side

	Mean	SD	t-test	P- Value	Significance
Group A	38.32	2.77	4.18	<0.0002	Significant
Group B	32.01	2.11			

Comparison of group A & group B Cervical Side Flexion Right Side Range of Motion



Graph 14: Comparison of group A & group B Cervical Side Flexion Right Side Range of Motion

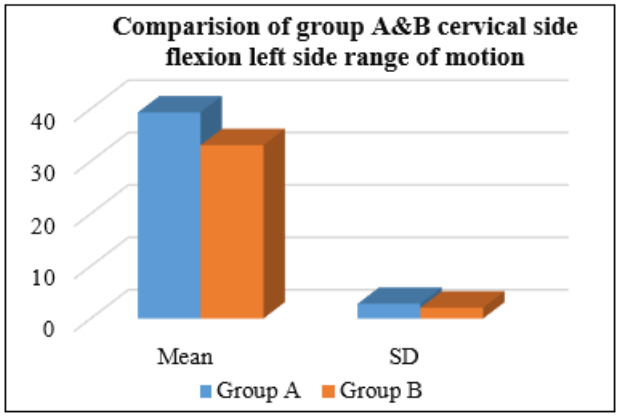
Result: The mean value of post- tests are 38.32&32.01, standard deviation of post- test are 2.77 & 2.11. The T value is 4.18 and p value is 0.0002

These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique.

Cervical Range of Motion Left Side

Table 15: Analysis of mean score of neck ROM in group A & group B
Side flexion Left Side

	Mean	SD	t-test	P- Value	Significant
Group A	39.32	2.81	3.39	<0.001	Significant
Group B	33.61	2.06			



Graph 15: Comparison of group A & group B Cervical Side Flexion Left Side Range of Motion

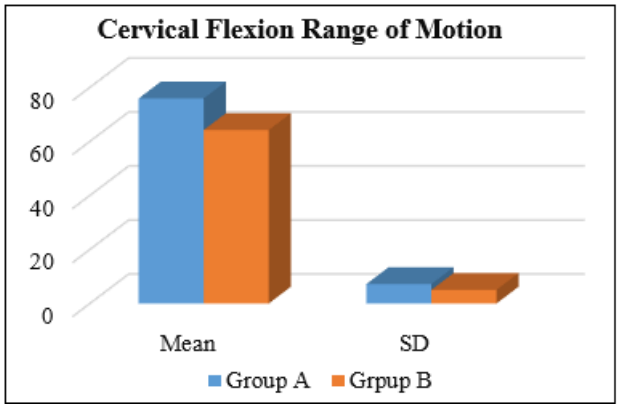
Result: The mean value of post test is 39.32&33.06, standard deviation of post- test is 2.81&2.06. The T value is 3.39 and p value is 0.0001.

These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique

Cervical Flexion Range of Motion

Table 16: Analysis of mean score of neck ROM in group A & group B
Cervical Flexion

	Mean	SD	t-test	P- Value	Significant
Group A	75.91	7.18	4.17	<0.0003	Significant
Group B	64.21	5.03			



Graph 16: Comparison of group A & group B Cervical Flexion Range of Motion

Result: The mean value of post- tests are 75.91&64.21, standard deviation of post- test is 7.18&5.03. The T value is 4.17 and p value is 0.0003.

These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique.

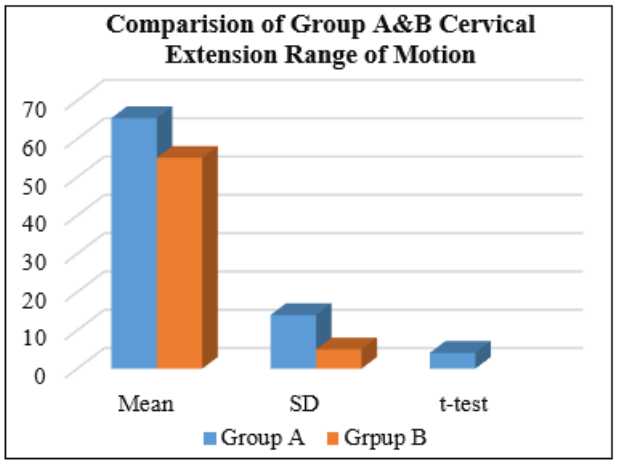
Cervical Extension Range of Motion

Table 17: Analysis of mean score of neck ROM in group A & group B
Cervical Extension

	Mean	SD	t-test	P- Value	Significant
Group A	65.41	14.02	4.12	<0.0003	Significant
Group B	55.04	5.03			

Comparison of group A & group B Cervical Extension Range of Motion

- The mean value of post- tests are 65.41&55.04, standard deviation of post- test is 14.02 & 5.03. The T value is 4.12 and p value is 0.0003.
- These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique.



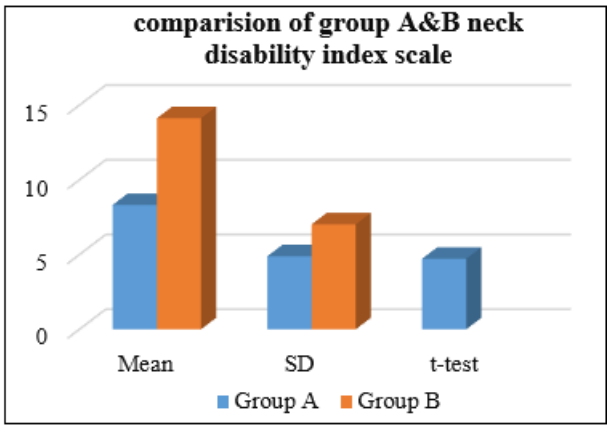
Neck Disability Index Scale

Table 6: NDI

	Mean	SD	t-test	P- Value	Significant
Group A	8.32	4.89	4.72	<0.0001	Significant
Group B	14.12	7.02			

Comparison of group A & group B Neck Disability Index Scale

- The mean value of post- tests are 8.32 & 14.12, standard deviation of post- test is 4.89&7.02. The T value is 4.72 and p value is0.0001.
- These values suggest there is significant improvement between Group A & Group B value in muscle energy technique & myofascial release technique.



4. Discussion

Trapezius muscle pain accounts for the vast majority of nonspecific neck pain. Muscle energy technique (MET) and myofascial release therapy (MFR) have been proposed as an adjunct to conventional therapies in many literatures to treat trapezitis without any attempts of comparing the effectiveness. Hence the present study was aimed to compare the effect of muscle energy technique and myofascial release therapy (MFR) in the subjects with chronic upper trapezitis as it is the most commonly found musculoskeletal disorder amongst young age group (1).

MET may influence pain mechanisms and promote hypoalgesia. Some studies suggest MET and related post-isometric techniques reduce pain and discomfort when applied to the spine or muscles. The mechanisms are not

known, but may involve central and peripheral modulatory mechanisms, such as activation of muscle and joint mechanoreceptors that involve centrally mediated pathways, like the periaqueductal grey (PAG) in the midbrain, or non-opioid serotonergic 11 and noradrenergic descending inhibitory pathways. Additionally, MET may increase fluid drainage and augment hypoalgesia. Rhythmic muscle contraction increases muscle blood and lymph flow rates and mechanical forces acting on fibroblasts in connective tissues change interstitial pressure and increase transcapillary blood flow. MET application may reduce pro inflammatory cytokines and desensitize 34 peripheral nociceptors (2)

Reflex muscle relaxation is commonly cited as the mechanism for length, range of motion (ROM), and tissue texture changes following MET. Muscle relaxation following isometric contraction is claimed to be mediated by the golgi tendon organ with its inhibitory influence on the α-motor neuron pool and by reciprocal inhibition from contraction of a muscle antagonists. However, studies support increased tolerance to stretching (hypoalgesia), not reflex relaxation, as the primary mechanism for increasing muscle length. An implicit assumption is that low-level motor activity, elevated in dysfunctional muscle, limits the passive stretch of muscles. Active motor activity does not appear to produce resistance to passive stretch, and increases in muscle length following passive stretching have occurred without change to the low-level EMG activity of the muscle. Thus, it seems factors other than reflex muscle relaxation are responsible for muscle extensibility and 34 ROM following these techniques. While in MFR, the gentle forces applied to the facial restrictions will elicit vasomotor response and increase blood flow to the affected area, thereby enhancing lymphatic drainage of toxic metabolic wastes. It also realigns the facial planes, and most importantly resets the soft tissue proprioceptive sensory mechanism. This latter factor reprograms the central nervous system, enabling a normal functional range of motion without eliciting the old pain pattern (3)

Paul J et al., who compared the effect of MFR and deep transverse friction massage for upper trapezius trigger point, explained that MFR improves the vertical alignment and lengthens the body providing more space for proper functioning of osseous structures, nerves, muscles, blood vessels and organs which improves the function. Barnes MF claimed that as a result of MFR, there is change in the viscosity of the ground substance of the muscle and fascia which can restore proper alignment of the muscle fiber and increase the joint mobility. He explained that MFR made the fascia elongated, softened and more pliable thereby, helping to restore the normal length of the fascia. Thus, it can be helpful to increase the flexibility and joint ROM. The resultant muscle relaxation may encourage a copious return of blood and oxygen, which dramatically elevates pain threshold and encourage healthy, compliant tissue. This promotes healing, reduces pain and pressure in the fibrous band of connective tissue or fascia by breaking up the adhesion (14)

Therapeutic Ultrasound refers to mechanical vibrations which are essentially the same as sound waves, but of a higher frequency. Therapeutic frequencies of ultrasound range from 0.5 to 5 MHz. It has been estimated that for an output of 1W/cm2 there is a temperature rise of 0.8°C/ min. Pain relief may also occur due to the non thermal effects of pulsed ultrasound in the form of stimulation of histamine release from mast cells and factors released from macrophages that accelerate the normal resolution of inflammation (3)

In group-A pre intervention mean of NDI was 38.68 After treating the subject with MET and Ultrasound, the mean value of NDI improved to 8.32 at the end of five days. The pre intervention mean of NPRS was 6.89 improved to 1.13 after five days. The pre intervention mean of side flexion (right and left) was 25.5 and 28.68 post intervention data at the end of session to 6.15 and 39.32 At the end of fifth day treatment session. The pre intervention mean of cervical flexion was 54.79 and post intervention data at the end of session 75.91. The pre intervention mean of cervical extension was 51.5 and post intervention data at the end of session was 70.56 the mean of ROM improved significantly to, which showed statistical significance within the group A.

In group-B pre intervention mean of NDI was 39.17 After treating the subject with MET and Ultrasound, the mean value of NDI improved to 5.57 at the end of five days. The pre intervention mean of NPRS was 6.89 improved to 2 after five days. The pre intervention mean of side flexion (right and left) was 26.22 and 26.28 post intervention data at the end of session to 35 and 36.61 At the end of fifth day treatment session. The pre intervention mean of cervical flexion was 56.06 and post intervention data at the end of session 73.56. The pre intervention mean of cervical extension was 51.39 and post intervention data at the end of session was 70.56 the mean of ROM improved significantly, which showed statistical significance within the group B.

Based on the statistical analysis, both group A and B showed good improvement in NDI, NPRS and ROM and it has also shown significant improvement clinically in reduction of pain, functional limitation and improved range of motion. Consequently both the groups showed ample improvement over baseline data. However, subjects in group-A who received MET and Ultrasound showed better improvement than the subjects in group-B who received MFR and Ultrasound when both the groups were compared at the end of sessions.

5. Limitations & Suggestions

5.1 Limitation

- Study was conducted for short duration
- This study was conducted with less number of samples

5.2 Suggestion

- Compare study with other population such as active lifestyle population.
- Further study with longer follow up and duration.

6. Conclusion

In this study Individually both Muscle energy technique and Myofascial release technique was found to be effective in

reducing neck pain, improving range of motion and reducing neck disability, however when both groups are statistically compared, significant difference was found in outcome measures which showed that muscle energy technique is more effective than Myofascial release technique. Hence, the alternate hypothesis has proved.

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