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To Compare The Efficacy Of A Combination Of Therapeutic Ultrasound With Soft Tissue Mobilization And Therapeutic Ultrasound With Static Stretching On Active Trigger Points Of Upper Fibers Of Trapezius

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Abstract

Introduction: Myofascial trigger point is a hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle's fascia, which is painful on compression and can give rise to characteristic referred pain, tenderness and autonomic phenomena. The primary outcome measures included the Neck Disability Index (NDI), Numeric Pain Rating Scale (NPRS), and Craniovertebral Angle (CVA). These findings offer valuable insights into the relative benefits of these therapeutic modalities and their potential application in clinical practice.[1]

NEED OF THE STUDY

Although various studies have been done using therapeutic ultrasound with soft tissue mobilization with different techniques but none of the studies have been done for comparison between soft tissue mobilization technique with therapeutic ultrasound versus static stretching with therapeutic ultrasound in improving active trigger point of upper fibres of trapezius.

Materials and Methods: The study was carried out with total of 34 subjects with myofascial trigger points in one side of upper trapezius will be assign in two groups with 17subjects in each group with mean age 26.47±26.52. After thorough assessment and consent was signed. This study was comparison between Group A (experimental group) soft tissue mobilization technique with therapeutic ultrasound versus Group B (control group) static stretching with therapeutic ultrasound in improving active trigger point of upper fibres of trapezius.

Conclusion: In conclusion, individually both the groups give significant results when we compared it from baseline, midline and post interventions but on comparsion between the groups there is non- significance difference. Thus, the null hypothesis is accepted. In conclusion both the groups are equally beneficial for the treatment of Myofascial Trigger points.Future studies could examine the long term effectiveness of these interventions in different patient population should be studied

KEYWORDS- Active Trigger Points on Upper Trapezius, Therapeutic Ultrasound, Soft Tissue Mobilization, Static Stretching.

INTRODUCTION

Myofascial trigger point is a hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle's fascia, which is painful on compression and can give rise to characteristic referred pain, tenderness and autonomic phenomena. Its types include active, latent, primary, associated, satellite and secondary. Trapezius TP1 (trigger point 1, in upper fibers of trapezius) is observed the most often of all myofascial trigger points in the body. This TP1 area makes a significant contribution to the facial pain of myofascial pain dysfunction syndrome, which is widely recognized by the dental profession. The severity of symptoms from myofascial trigger points ranges from painless restriction of motion due to latent trigger points, so common in the aged, to agonizing incapacitating pain caused by very active trigger points. [1]

Trigger points can arise from multiple causes. Muscles become vulnerable when they are under acute or chronic stress. However, they occur most frequently in axial muscles used to maintain posture, due to constant tension and micro trauma of poor postural habits, both in everyday living and in the workplace. Myofascial pain has a high prevalence among individuals with regional pain complaints. [2 & 10]

Trigger points described as 'active' are always tender on direct palpation, may be painful in the absence of applied pressure, and are more likely to elicit a jump sign when adequately stimulated. In comparison, 'latent' trigger points are painful and elicit a pain referral pattern only when direct pressure is applied.[3] Without perpetuating factors, an active trigger point tends to revert to and persist as a latent trigger point.[4]

Manual palpation skills, in conjunction with patient feedback, have primarily been used for trigger point diagnosis and treatment.[3] The major goal of myofascial trigger point therapy is to relieve pain and tightness of the involved muscles.[5]

In this study, a comparison between immediate effects of ultrasound combined with static stretching and ultrasound combined with soft tissue mobilization (STM) on active trigger point of upper fibers of trapezius is done. Ultrasound treatment involves the use of high frequency acoustic energy that is generated using the reverse piezoelectric effect to produce thermal and non thermal effects in tissue. Pain relief is theorized to be related to washout of pain mediators by increased blood flow, changes in nerve conduction velocity, or alterations in cell membrane permeability that decrease inflammation.[5,6]. The ultrasonic waves show evidence of having greater effectiveness in muscle tissue than infat; thus, they permit deeper penetration by avoiding absorption of the energy insubcutaneous fat.[11]

Stretching exercises form the basis of exercise treatment of myofascial pain. This treatment addresses the muscle tightness and shortening that are closely related with pain in this disorder and permits gradual restoration of normal activity.[7] Other study also support the use of ultrasound therapy combined with stretching exercises for the treatment of trigger points. [12, 5]

Other studies showed the immediate effectiveness of ultrasound therapy combined in improving the pain threshold of active trigger points.[13]

Soft tissue mobilization is the application of specific and progressive manual forces with the intent of promoting changes in the myofascia, allowing for elongation of shortened structures.[8] STM is said that massage is an excellent tool in the treatment of myofascial pain syndromes and at times the sole treatment necessary. A reasonable course of therapeutic massage along with other modalities may be tried before an invasive procedure such as injection is pronounced necessary. A combination of massage techniques can be used when treating trigger points. [14]

Treatment of trigger points in upper trapezius utilizing ultrasound and static stretching has also been studied and compared with treatment by trigger point injection and stretching exercise, wherein both the treatments showed significant results.[5] However, the immediate effects of ultrasound combined with static stretching on trigger points of upper trapezius and its comparison with ultrasound combined with soft tissue mobilization have not been studied. Thus, in this study, both these treatment options are used to determine their immediate effects in reducing the symptoms and then are compared for their effectiveness. This study will determine the efficacy of the two chosen treatment interventions for the active trigger point in upper trapezius muscle and thus may help in developing an effective physiotherapy treatment protocol for such problems.

The goal is to restore the muscle to normal length, posture and full joint range of motion. Preventing the redevelopment of a trigger point includes maintaining the exercise program and controlling all contributingfactors that initiate the development of trigger points, perpetuate the persistence of trigger points, and result from the chronic pain.[15]

AIM & OBJECTIVE OF THE STUDY

AIM

The aim of this study to compare the efficacy of a combination of therapeutic ultrasound with soft tissue mobilization and therapeutic ultrasound with static stretching on active trigger point of upper fibers of trapezius.

OBJECTIVE

To assess the effectiveness of therapeutic ultrasound with static stretching on active point of upper fibres of trapezius. The major goal of myofascial trigger point therapy is to relieve pain and tightness of the involved muscles.

NEED OF THE STUDY

Although various studies have been done using therapeutic ultrasound with soft tissue mobilization with different techniques but none of the studies have been done for comparison between soft tissue mobilization technique with therapeutic ultrasound versus static stretching with therapeutic ultrasound in improving active trigger point of upper fibres of trapezius.

HYPOTHESIS

Alternative Hypothesis

There may be sufficient difference between the effect of a combination of therapeutic ultrasound with soft tissue mobilization and therapeutic ultrasound with static stretching on active trigger point of upper fibers of trapezius.

Null Hypothesis

There may not be significant difference between the effect of a combination of therapeutic ultrasound with soft tissue mobilization and therapeutic ultrasound with static stretching on active trigger point of upper fibers of trapezius.

REVIEW OF LITERATURE

Chang- Zern Hong et al (1993) has conducted the study on immediate effectiveness of ultrasound therapy in improving the pain threshold of active myofascial trigger points. A total of 84 subjects with myofascial pain syndrome and 24 normal subjects were studied. It would appear that all 4 therapeutic modalities can be effectively applied for the treatment of myofascial pain syndrome to obtain an immediate increase of pain

threshold of an active myofascial trigger point, although the stretch therapy is more effective than the thermotherapy.

Gam et al (1998) has conducted the study on the effect of treatment with ultrasound, massage and exercises on myofascial trigger-points (MTrP) in the neck and shoulder was assessed in a randomised controlled trial. A total of 67 subjects were initially included in the trial, but nine dropped out during the study. The treatment groups had a reduction of number and intensity of myofascial trigger points compared with a control group but no difference was found in ultrasound versus sham ultrasound with respect to reducing pain assessed by analgesic usage, visual analogue scale (VAS) on function and at rest. No explanation was given for the failure of ultrasound therapy by the authors.

Esenyel et al (2000) has conducted the study on the effectiveness of ultrasound treatment and trigger point injections in combination with neck-stretching exercises on my ofascial trigger points of the upper trapezius muscle. A total of 102 subjects who had myofascial trigger points in one side of the upper trapezius. Treatment effectiveness was assessed using subjective pain intensity (PI) with a visual analog scale, pressure pain threshold (PT) with algometry, and range of motion (with a goniometer) of the upper trapezius muscle. Patients with myofascial pain syndromehad higher scores for anxiety than for depression. When combined with neck stretching exercises, ultrasound treatment and trigger point injections were found to be equally effective.

Niraj Kumar, Shama Praveen, Randhir Kumar et. al. (2020), The present study proved that the McKenzie protocol is more successful than isometric exercise. So we can apply the McKenzie protocol to the patient having radicular pain in clinical practice. McKenzie protocol (neck retraction) that causes extension of the lower cervical segments and may allevate stress on the posterior annulus and thereby relive pain. In patients with radicular pain, repeated neck retraction is shown to result in a significant decrease nerve root compression.

Javid Majlesi et al and Esenyl et al (2004) has conducted study on the use of ultrasound therapy combined with stretching exercises for the treatment of trigger points. A total of72 subjects were selected and study group was formed by using high-power, pain- threshold, static ultrasound technique resolves acute active trigger points more rapidly than does treatment with conventional ultrasound technique. Someday it may be found more cost effective because it significantly decreases the number of PT treatment session.

METHODOLOGY:

The study was baseline, midline and post-test comparative design.The study was carried out with total of 34 subjects with active myofascial trigger points on upper trapezius will be assign in two groups with 17 subjects in each group . After thorough assessment and consent was signed, study was conducted at the department of Physiotherapy,SMI Hospital, Dehradun. Each subjects received the treatment for 5days/weeks. Time duration of the treatment was approx.. 25 minutes for each session. The subject were selected according to inclusion and exclusion criteria. Subjects were included as with mean age of 26.47±26.52. Palpable tender spot in the upper trapezius fibers. Palpate the local twitch response on snapping palpation at the most sensitive spot in the taut bands of upper trapezius. Pain recognition upon palpation (time=10 sec).Taut bands of upper trapezius muscle. Restricted range of motion in lateral bending of the cervical spine to the opposite side by measure the

craniovertebral angle ranges below 45^0. Subjects were excluded that having myofascial trigger point injections or receiving physical medicine in the year preceding this study. Having a history of neck, shoulder surgery within a past year. Having a history of inflammatory joint or muscle disease, infection, or malignancy such as rheumatoid arthritis. Having an evidence of neurologic deficit such as myelopathy or radiculopathy. Having a history of disk disease, degenerative disease, fracture or dislocation in the cervical vertebrae. Exhibiting inadequate co-operation.

OUTCOME MEASUREMENTS, Craniovertebral Angle, Numeric Pain Rating Scale, Neck Disability Index.

PROCEDURE:

Subjects who fulfil the inclusion and exclusion criteria was randomly allocated into two groups A and B. Individuals selected for the study were assessed baseline, midline and post of the intervention program with outcome measure like, Craniovertebral Angle, Numeric Pain Rating Scale, Neck Disability Index.

GROUP A: receives soft tissue mobilization with therapeutic ultrasound therapy,

Patient was seated on a chair and upper fibers of trapezius were palpated for the trigger point. The area was marked using a marker. These patients were first treated with therapeutic ultrasound (continuous) with the dosage of 1.5W/cm2 , 3 MHz for 8 minutes at the trigger point or the taut band of upper fibers of trapezius muscle and at the referred pain area.

Then the patient was positioned in prone lying with head turned towards uninvolved side and the identified restrictions were treated with soft tissue mobilization utilizing a combination of effleurage and kneading to trapezius myofascia for 10 minutes (starting with 10 seconds of effleurage then 20 seconds of kneading and then both alternating for 30 seconds each, ending with effleurage) [Figure- 1 & 2].

Figure- 1; Diagramatic Presentation of Application of therapeutic ultrasound on trigger point of upper trapezius

Figure- 2; Diagramatic Presentation of Application of soft tissue mobilization on trigger point of upper trapezius

Group B receives static stretching with therapeutic ultrasound therapy.These patients were treated with ultrasound (continuous) with the dosage of 1.5W/cm2, 3 MHz for 8 minutes at the trigger point or the taut band of upper fibers of trapezius. And then followed by passive stretching of trapezius upper fibers. The end position was maintained for 30 seconds and the procedure was repeated 4 times with a rest period of 15 seconds between two stretch cycles.Passive stretching for upper fibers of trapezius: [9]

Patient's position: supine lying. The stretch was a three movement stretch. The first component was a lateral bend to stretch the side bend component of the muscle (the more anterior fibers). The second position was forward, maintaining the lateral bend, to stretch the extension component of the trapezius (the more posterior fibers).The final movement was rotation of the back of the head away from the side being stretched, while maintaining the lateral-forward head position, because the trapezius inserts in the back of the head on the inion [Figure- 3 & 4].

Figure-3;Diagramatic Presentation of Application of ultrasound on trigger point of upper trapezius

Figure-4; Diagramatic Presentation of Position for static stretching of upper trapezius

DATA ANALYIS: Statistical analysis was carried out with statistical software SPSS 21 version and Microsoft word, Excel has been used to generate graphs and tables. Various statistical measures such as mean, standard deviation, were utilized for all the scores of participants included in the study. To analyze the difference between Group-A (Experimental group) and Group B (Control group), and between the Groups A and B in baseline 1st week, midline 3rd week and post 6th week score measurements one way ANOVA was used.

RESULT: result shows statistically non-significant value when p value was set in < 0.05%

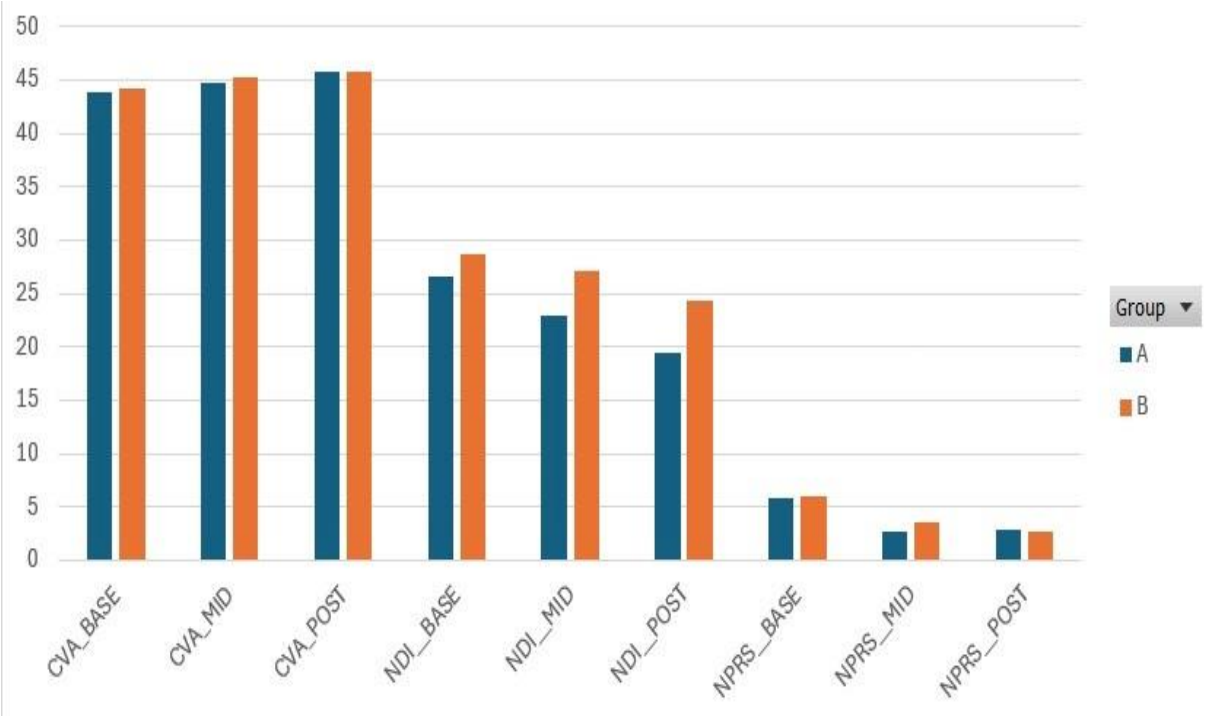
Table: Comparision of mean, standard deviation, F value and P value between the Group A and Group B of CVA, NPRS and NDI at baseline, midline and post score measurement.

Group A	Mean ±SD	Group B	Mean ±SD	F-value	P- Value	Result
CVA Baseline	43.84 ± 1.83	CVA Baseline	44.25 ± 1.96	3.199	0.010	Significant
Mid	44.66 ± 2.03	Mid	45.21 ± 1.47			
Post	45.80 ± 2.37	Post	45.86 ± 1.59			

Group A	Mean ±SD	Group A	Mean ±SD	F-value	P- Value	Result
NPRS Baseline	5.82 ± 1.50	NPRS Baseline	6.05 ± 1.14	25.653	0.001	Significant
Mid	2.64 ± 1.32	Mid	3.52± 1.12			
Post	2.88 ± 1.69	Post	2.64 ± 0.785			

Group A	Mean ±SD	Group A	Mean ±SD	F-value	P- Value	Result
NDI Baseline	26.64 ± 5.31	NDI Baseline	28.70 ± 4.45	8.809	0.001	Significant
Mid	22.94 ± 5.22	Mid	22.94 ± 5.22			
Post	19.47 ± 5.45	Post	24.35 ± 4.78			

Graphical representation of mean between the Group A and Group B of CVA, NPRS and NDI at baseline, midline and post score measurement:



DISCUSSION: Various studies have been done in subjects with young healthy population using therapeutic ultrasound with soft tissue mobilization with different techniques but none of the studies have been done. Thus, present study was planned to comparison between soft tissue mobilization technique with therapeutic ultrasound versus static stretching with therapeutic ultrasound in improving active trigger point of upper fibres of trapezius. The present study include 34 subjects with assigned consent, and were selected as sample size with the mean age of 26.47± 26.52 and mean BMI of 25.1 ±23.32. Age between 18-45 years a relatively young population of patients was recruited to minimize pain that might be caused by accompanying degenerative disc and joint diseases.

The purpose of this study aimed was to compare the efficacy of two therapeutic interventions—therapeutic ultrasound combined with soft tissue mobilization (Group A) and therapeutic ultrasound combined with static stretching (Group B)—on patients with active trigger points in the upper trapezius muscle have an immediate effect on neck pain and cervical range of motion. The primary outcome measures included the Neck Disability Index (NDI), Numeric Pain Rating Scale (NPRS), and Craniovertebral Angle (CVA). These findings offer valuable insights into the relative benefits of these therapeutic modalities and their potential application in clinical practice.

The comparison of craniovertebral angle of Group A showed statistically significant improvements in all the outcome measures for both groups. In craniovertebral angle (CVA) the group A showed a significant improvement in CVA from a baseline mean of 43.84^0 to a post-intervention mean of 45.80^0, with a p-value of 0.031. And a group B also demonstrated significant improvement, with a baseline mean of 44.25^0 increasing to

45.86^0 post- intervention, with a p-value of 0.019. The comparison between the two groups revealed the both interventions were effective, In contrast, Group B, which received therapeutic ultrasound combined with static stretching, demonstrated superior outcomes in CVA measurements, indicating better correction of postural deviations commonly associated with upper trapezius muscle dysfunction. For instance, study by the Dae- Hyun Kim etal (2018) conducted a study on "Neck pain in adults with forward head posture: effects of CVA angle and cervical range of motion". The study suggested that decreased CVA and cervical flexion range, were predictive factors for the occurrence of pain in the cervical region. [16]

In statistically analyzing of numeric pain rating scale (NPRS) score of the group A's NPRS scores decreased significantly from a baseline mean of 5.82 to a post- intervention mean of 2.88, with a p-value of 0.001 indicating a substantial reduction in pain. And a group B exhibited similar pain reduction, with NPRS scores dropping from a baseline mean of 6.05 to a post intervention mean of 2.64 with a p-value of 0.001. This data suggest that both treatment are effective in pain management, with no significant difference between the groups.

In statistically analysing of neck disability index (NDI) score of the group A's scores improved significantly, from a baseline mean of 26.64 to a post- intervention mean of 19.47, with a p-value of 0.001, showing a reduction in disability related to neck pain. And a Group B also showed significant improvement from a baseline mean of 28.70 to a post- intervention mean of 24.35 .with a p-value of 0.025. But Group A showed more significant improvements. These improvements suggest that this treatment modality was more effective in reducing disability and pain associated with myofascial trigger points in the upper trapezius muscle. For instance, study by the Cyanna Joseph D'souza, et al (2020) conducted a study on "The effect of positional release technique on upper trapezius myofascial trigger points". This study aimed to determine the effectiveness of the Positional Release Therapy (PRT) for treating Myofascial Trigger Points (MTrPs) in the upper trapezius muscle on outcomes of pain (NPRS), Range of Motion (ROM) and (NDI). There is evidence to support the construct validity of the verbal NPRS. For this, participants indicated the intensity of pain by reporting a number that best represented it, between 0 (no pain) and 10 (maximum pain). The NDI is a 10-item questionnaire which has shown to be a valid and reliable measure of disability in individuals with neck pain . It is scored from 0–50 points (0–100%) in which higher scores correspond to greater levels of disability. The result concluded that the increase in ROM and alleviated levels of pain and disability were noted in all participants post treatment. This case series suggests that a short-term manual therapy technique, such as the PRT would be beneficial in treating individuals with upper trapezius TrPs.[17]

The results of this study align with and expand upon previous research in the field of myofascial pain syndrome (MPS) and trigger point therapy. The positive effects of therapeutic ultrasound, particularly when combined with manual therapy techniques such as soft tissue mobilization, have been well-documented. For instance, studies by Chen-Zern Hong et al. (1993)[19] and Esenyel et al. (2000)[5] have shown that ultrasound therapy can effectively reduce pain and improve muscle function by enhancing blood flow and facilitating the removal of metabolic waste products from the affected tissues. The current study corroborates these findings, particularly

regarding the reduction in NPRS scores observed in Group A. Furthermore, the combination of ultrasound with soft tissue mobilization appears to be particularly effective in addressing the functional impairments associated with MPS, as evidenced by the significant improvements in NDI scores. This is consistent with the work of Joseph J. Godges et al. (2003), who highlighted the role of soft tissue mobilization in elongating shortened myofascial structures and restoring normal muscle length and function. [8] The findings from Group A suggest that this combination therapy not only alleviates pain but also enhances overall neck function, as reflected in the improved NDI scores.

Conversely, the superior CVA outcomes in Group B underscore the effectiveness of static stretching in addressing postural abnormalities. The trapezius muscle plays a critical role in maintaining head and neck posture, and dysfunction in this muscle often leads to deviations such as forward head posture, which is commonly assessed using the CVA. The results for Group B are in line with previous research by Travell and Simons (1981), who emphasized the importance of stretching exercises in the management of MPS. Stretching helps to lengthen shortened muscle fibers, reduce muscle stiffness, and correct postural deviations, thereby improving the craniovertebral angle.[1]

The differential outcomes observed in this study can be attributed to the distinct mechanisms of action associated with each treatment modality. Therapeutic ultrasound, as used in both groups, provides a combination of thermal and non-thermal effects that enhance tissue healing, reduce muscle spasms, and increase the extensibility of collagen fibers. However, the addition of soft tissue mobilization in Group A appears to amplify these effects by directly targeting the myofascial trigger points, leading to greater reductions in pain and disability. This synergistic effect is likely due to the mechanical disruption of adhesions within the muscle tissue, improved circulation, and the subsequent reduction in local muscle tension.

In contrast, the static stretching protocol employed in Group B, while less effective in reducing immediate pain and disability, proved to be more beneficial in improving posture, as reflected in the CVA measurements. The result of this study have also been supported by another study done by Kenneth C. Wessling et al,(1987) who had shown the immediate effectiveness of ultrasound combined with static stretching in improving the muscle extensibility. They also showed that the combination of these two procedures yielded better results than static stretching alone.[18] Static stretching targets the length-tension relationship of the muscle, gradually elongating the muscle fibers and restoring their optimal resting length. This process is particularly important in correcting postural deviations that arise from chronic muscle shortening and imbalances. The superior CVA outcomes in Group B suggest that static stretching may be more effective in addressing the biomechanical aspects of MPS, particularly in patients with postural dysfunctions.

The differential effects of these treatments highlight the importance of tailoring therapeutic interventions to the specific needs of the patient. For individuals whose primary complaint is pain and functional limitation, a treatment approach that includes soft tissue mobilization may be more beneficial. On the other hand, for patients with significant postural deviations, static stretching may offer more pronounced improvements. This underscores the need for a comprehensive assessment of each patient to determine the most appropriate therapeutic strategy.

Clinical Relevance

The aim of the clinical research was to find out first-line treatment recommendation Therapeutic ultrasound combined with soft tissue mobilization should be considered a primary treatment for patients with Myofascial Pain Syndrome (MPS) presenting with significant pain and disability. This combination therapy not only provides immediate pain relief but also significantly improves neck function, as evidenced by improvements in NDI scores. The study underscores the importance of tailoring treatment to the unique needs of each patient, considering specific symptoms, functional limitations, and postural abnormalities.

Limitations of the Study

The sample size of 34 participants may limit the generalizability of the results.
The study focused on immediate effects without capturing long-term outcomes.
The absence of a control group receiving no treatment or a placebo intervention makes it difficult to isolate the specific effects of the therapeutic interventions.

Future Scope of the Study

The study utilized the two treatment interventions for producing immediate improvement in symptoms of trigger point in upper trapezius. The long term effects of these interventions should be studied.
Future studies could examine the effectiveness of these interventions in different patient population.
The effects of these interventions on trigger points in other muscles groups affected by MPS, such as the levator scapulae and infraspinatus, and in patients with varying levels of MPS severity should also be studied.

CONCLUSION: In conclusion, individually both the groups give significant results when we compared it from baseline and post interventions but on comparision between the groups there is non- significance difference. Group A (experimental group) therapeutic ultrasound combined with soft tissue mobilization and Group B (control group) therapeutic ultrasound combined with static stretching. Thus, the null hypothesis is accepted. In conclusion both the groups are equally beneficial for the treatment of Myofascial Trigger points. But in other hand Group A demonstrates that therapeutic ultrasound combined with soft tissue mobilization is highly effective in patients with active trigger points in the upper trapezius muscle, as evidenced by significant improvements in NDI scores than Group B. Conversely, Group B therapeutic ultrasound combined with static stretching is more effective in correcting postural deviations, as indicated by superior CVA outcomes than Group A. And both the groups (Group A and Group B) demonstrate are highly effective in reducing pain in

patients with active trigger points in the upper trapezius muscle, as evidenced by significant improvements in NPRS scores. These findings underscore the importance of tailoring therapeutic interventions to the specific needs of the patient and highlight the potential of both soft tissue mobilization and static stretching as valuable tools in the management of myofascial pain syndrome.

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