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Comparison between effects of instrument-assisted soft tissue mobilization and manual myofascial release on pain, range of motion and function in myofascial pain syndrome of upper trapezius — A randomized controlled trial

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Background: Myofascial pain syndrome (MPS) is a muscle pain disorder characterized by the presence of Myofascial Trigger Point (MTrP) within a taut band, local tenderness, referral of pain to a distant site, restricted range of motion, and autonomic phenomena. The upper trapezius is the muscle most often affected by MTrPs. Manual myofascial release (MFR) and Instrument-Assisted Soft Tissue Mobilization (IASTM) are techniques of soft tissue release that are used to resolve MPS. Fifty six percent of physiotherapists complain of pain in multiple areas due to the massage and manual therapy that they have to perform.
Objective: The objective of this study is to find whether IASTM is better than manual MFR in treating patients with MPS in upper trapezius.

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Methods: This study was a single-blinded randomized controlled trial that included 31 participants, both males and females between the age groups of 18–50 years. Participants were randomly divided into two groups. Three sessions were given over a period of one week for both groups. Group A received IASTM along with conventional treatment and Group B received Manual MFR along with the conventional treatment. The outcome measures evaluated were pain, cervical range of motion, pain pressure threshold (PPT) of trigger points, and the neck disability index. Pre- and post-measurements were taken and the analysis was done.
Results: Both the treatment methods significantly reduced pain, improved PPT, range of motion, and function. The effects between the groups showed that IASTM was significantly better than manual MFR to reduce pain. The improvement in PPT, range of motion and function were equal in both the groups.
Conclusion: IASTM and manual MFR both are effective individually as treatment procedures for pain, PPT, range of motion, and function. Neither of the treatment options can be considered better that the other. The clinician can decide based on the availability of the instrument, training, patient's preference, and his/her comfort whether which of the two treatment methods should be used.

Keywords: Instrument assisted; myofascial; trapezius.

Introduction

Prevalence of myofascial pain syndrome (MPS) has increased manifolds in the recent years.[1] Due to the considerable economic burden that it imposes, there is an imperative need to identify the best treatment strategies for the same. MPS is the most common reason for chronic pain. Out of those suffering from MPS, more than 50% continue to have it even one year after diagnosis.[2]

Simons *et al.* defined MPS as a muscle pain disorder characterized by the presence of Myofascial Trigger Point (MTrP) within a taut band, local tenderness, referral of pain to a distant site, restricted range of motion, and autonomic phenomena.[3]

Travell and Simons first proposed and defined MTrP. An MTrP on mechanical stimulation produces a referred pain pattern typical of that muscle, visible or palpable local twitch response and restricted range of motion.[4] MTrPs are hypersensitive, cord-like or nodular tender spots found in a skeletal muscle. They are painful on palpation, compression or stretch. The prevalence of affection of these trigger points have found to be more in postural muscles such as the trapezius.[5] It has been found that 85% of people who come to pain clinics show presence of trigger points in the neck, and that occurs more commonly in women than men.[6]

The upper trapezius is a postural muscle and has a high susceptibility for overuse.[7] It is probably the muscle most often affected by MTrPs. The pain pressure threshold (PPT) of eight different muscles with a pressure algometer was measured in a study and it was determined that the upper trapezius was most sensitive to the pressure of the muscles tested. The trigger point sites in the upper trapezius commonly refer pain along the posterolateral aspect of the neck, behind the ear to the temple.[8]

MTrP in the upper trapezius is known to usually present with complains of neck pain, headache, muscle stiffness, restricted ROM of the cervical joint, and insomnia by the patient. It is frequently caused by poor posture, acute trauma, muscle stress, and psychological stress.[1]

Neck pain is found to be most common in people within the working age group of 20–50 years, especially in people having desk jobs and who tend to have forward neck posture.[9] The International Association of Pain (IASP) proposed a classification based on the duration of neck pain, as: acute neck pain which lasts less than 7 days, subacute neck pain which lasts for more than 7 days but less than 3 months, and chronic neck pain which lasts for a duration of 3 months or more.[10]

MFR is a technique of soft tissue mobilization which facilitates mechanical, neural, and psychophysiological adaptive potential as interfaced via the myofascial system.[8] MFR is the manual application of long duration and low load stretch to the myofascial complex which results in restoring its shortened length, decreased pain and improves function.[11]

Focused MFR is used to target specific muscles. This technique focuses on release of smaller restrictions and subtle malalignments that are present in the muscle and fascia.[12]

Sustained manual pressure referred to as ischaemic compression in this study has been given to one group of participants as a part of the manual MFR protocol.

This technique is known to have effects in resolving MTrPs. It is found that the MTrP bands and nodules are formed due to localized bulging and shortening of the sarcomere to produce 'contraction knots' or 'contraction discs'. Ischaemic compression reduces the height of the sarcomere and causes concomitant lengthening of the sarcomere. Hou *et al.* found the effectiveness of ischaemic compression in resolving MTrPs of Upper Trapezius muscle.[1,13]

Instrument-assisted soft tissue mobilization (IASTM) is based upon the rationale introduced by James Cyriax. Unlike the Cyriax approach which utilizes digital cross friction, IASTM is given using specially designed instruments.[14] It is a simple and practical technique. The surface of the instrument minimizes the force applied by the practitioner, but maximizes the force that is delivered to the tissues, hence, it is possible to stimulate deeply situated points of adhesions.[15] IASTM stimulates connective tissue remodelling via resorption of excessive fibrosis, it induces repair and regeneration of collagen secondary to fibroblasts recruitment. This in turn causes release and breakdown of scar tissues, adhesions, and fascial restrictions.[14]

IASTM is different from traditional MFR as it uses specifically designed instruments to apply longitudinal pressure along the length of muscle fibres. The grits and vibrations felt during scanning the affected area facilitate the clinician's ability to evaluate myofascial restrictions. Additionally, the instrument provides a mechanical advantage to the clinician to treat with deeper force transmission than while treating manually. This instrument reduces the stresses imposed on the clinician's hand.[16]

When IASTM is applied for rehabilitation, it is generally given in the following six steps: Examination, warm up, IASTM, stretching, strengthening exercises, and cryotherapy. Warming up the tissues beforehand increases the blood supply and makes the tissues more pliable. One side effect of IASTM is occurrence of petechiae. Petechiae is a response that occurs due to the damage of superficial capillaries and bruising that gives a reddish discoloration on the area treated. Another side effect is occurrence of muscle soreness. Both these side effects can be controlled with cryotherapy.[15]

Various instruments have been developed for use with soft tissue mobilization that differs in material, size, and shape. One such tool is used in this study, The Edge Mobility Tool, which is a stainless steel tool with multiple dull and sharp edges that contour the body for targeting the deep and superficial tissues.[17]

Exercises also have been considered as one of the evidence-based modalities for decreasing pain, increasing muscle strength, endurance, and flexibility. Hence, they help in reducing fear of movement and enhancing normal life activities. Recent studies also suggest that exercises including not only neck but also the scapulothoracic region are more beneficial for management of chronic neck pain.[18,19]

Poor scapular stabilization would increase the activity of the upper trapezius for stabilization, which in turn results in increased scapular elevation and stress on the cervical origin of upper trapezius.[20]

Fifty-six percent of physiotherapists complain of pain in multiple areas due to the massage and manual therapy that they have to peform.[21]

The purpose of this study is to find whether IASTM is better than manual MFR in treating patients with MPS in upper trapezius.

Methodology

This study was conducted in the Physiotherapy Outpatient Department of a tertiary care centre and was a Randomized controlled trial (single blinded).

Participants

Patients with MPS of upper trapezius were included. Sample size was 32 which was calculated using G-power[22,23] where, $Z\alpha = 1.96$ (95% confidence limit), $Z\beta = 0.954$, and $d = 1.332$.[24]

Ethical approval was taken from the ethical committee of Sancheti Institute for Orthopaedics and Rehabilitation. Subjects were selected on the basis of inclusion and exclusion criteria. Patients that were included were both males and females between 18 and 50 years of age with the Maximum NPRS on activity score ranging from 4 to 8 and had at least one trigger point present within a taut band in upper trapezius muscle. Patients taking analgesics within 48 h before first physiotherapy treatment or those who were diagnosed with fibromyalgia, sensory disorders, disc disease, radiculopathy, torticollis, ankylosing spondylitis, fracture or dislocation of cervical vertebrae, and who had underwent any recent surgery of the cervical spine or shoulder were excluded from the study.

Participants were instructed to avoid all forms other treatments until the entire treatment protocol is finished.

Intervention

Three sessions scheduled on alternate days over a period of one week were given to both the groups. The treatment began with hot pack for 10 min over the upper trapezius region followed by soft tissue release technique (IASTM to group A and Manual MFR to group B). After the technique, exercises were given which included active range of motion exercises for cervical spine (10 repetitions of each movement), chin tuck exercises 10 s hold and 10 reps. and scapular sets (10 s hold and 10 reps). The treatment was concluded with cryotherapy using ice pack for 10 min to prevent muscle soreness. Post intervention measurements were taken after the last session.

Procedure for IASTM

The patient was in a prone position with his/her head in neutral. A moisturizing cream was applied on the skin for lubrication. Scanning for myofascial restrictions was done with the sharper side of the edge tool (Fig. 1). The tool kept at an angle of 60°.[15,25,26] For treatment, the blunt side of the edge tool was used and short strokes were given at the areas with restrictions for 4–5 min, in a direction parallel to the muscle fibres.

Procedure for MFR

The following method was used for the focused stretch of upper trapezius:

A Unilateral Focused Stretch of the Upper Trapezius was performed with the patient in supine. The therapist placed the web space of one hand at the base of the occiput and used one or more fingers of the other hand to stretch the neck portion of the Upper Trapezius. This position was held until the release was felt. The release sequence was repeated, by moving the hand down the muscle fibres until the entire Upper Trapezius was released. The patient's head was rotated laterally and the release sequence was repeated until a soft end-feel was reached.[27]

Fig. 1. The EDGE tool.

For ischemic compression

The muscle was lengthened to the point of increasing resistance within the comfort zone and then a gentle, gradually increasing pressure was applied until the tissue resistance is felt. The pressure was intermediate and maintained up to 60–90 s until a relief of tension is felt under the palpating finger. Then, the pressure was increased until a new barrier was felt and held until tissue tension released.[1]

Outcome measures

All the outcome measures were assessed at baseline and after completion of the treatment protocol. Pain intensity was measured by Numerical Pain Rating Scale (maximum NRS during activity, NRS at the time of evaluation), Neck function by Neck Disability Index, PPT using pressure algometer for the trigger points, and cervical range of motion for flexion and opposite side lateral flexion was measured using inclinometer.

Assessment:

1. Intensity of pain was assessed by numerical pain rating scale.
   The subjects were asked to rate their pain on a scale of 0–10 on the NPRS. They were asked to rate the pain that was present at the time of evaluation before the treatment began and after the third treatment session. Also, subjects were asked to rate the maximum pain they had experienced throughout the day during any activity.
2. Evaluation of cervical range of motion of flexion and opposite side lateral flexion movements using a pair of inclinometers was done.
   One inclinometer was placed on the vertex and the other at the spinous process of the first thoracic vertebra. The patient was then asked to do the movement with the inclinometers held in that position by the assessor. The reading in the inclinometer at the first thoracic vertebra was subtracted from that of the one on the vertex and the range of motion was determined.
3. Trigger points were palpated using the flat palpation technique[25] and marked with a pen and a picture was clicked with the patient's consent as a reference for subsequent treatment and assessment sessions. Evaluation of PPT over the trigger points using pressure algometer was done. Three readings for each trigger point were recorded and their average was used for analysis.

4. Evaluation of functional neck disability using a Neck Disability Index was done.

Randomization

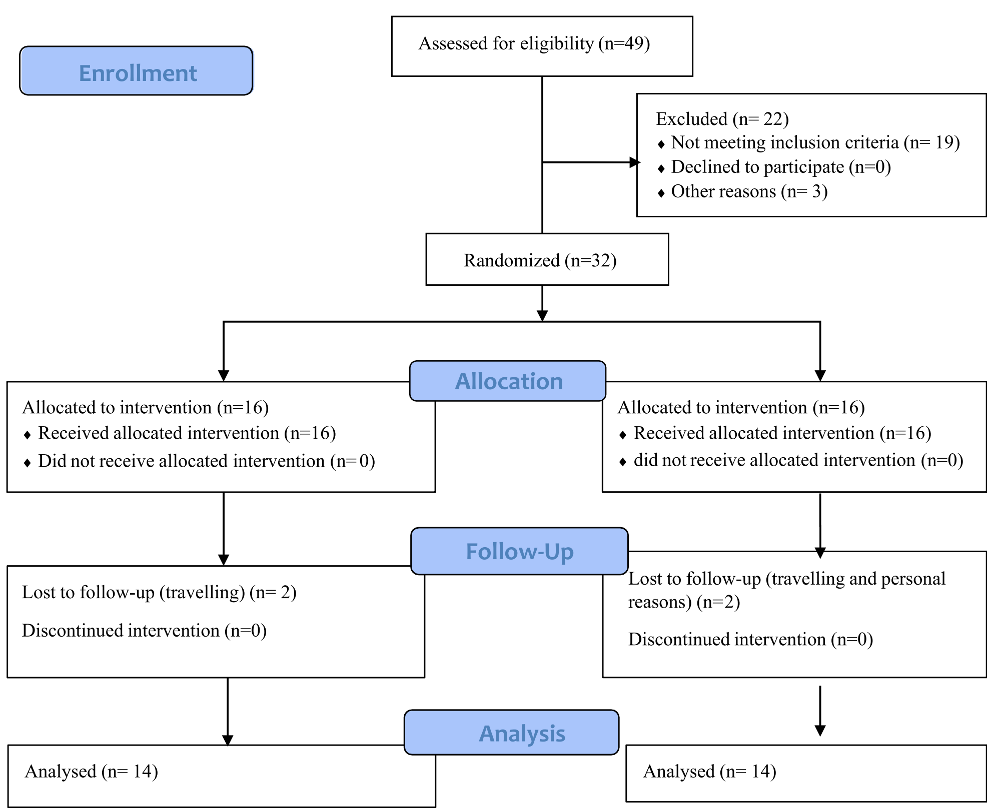
Participants were randomly allocated to the two groups using computer generated random numbers.

Each participant was assigned a number from 1 to 32 sequentially as they were recruited in the study. The computer randomly allocated numbers from the sequence of 1–32 to two different groups.

Blinding: This was a single blind study where the outcome assessor was blinded to minimize the bias in the outcomes. The blinded assessor was kept unaware of the participant's group allocation and the treatment being given. The outcome assessor was equally qualified and skilled to assess the decided outcome measures i.e., NPRS, PPT, NDI, and ROM.

All the subjects were explained the entire study design at the time of taking their consent and were also aware of their group allocation.

CONSORT Flow Diagram



Results

This study included 32 patients out of which four dropped out, two from each group due to personal reasons. Both the groups had 14 subjects each. No significant differences existed between the groups at baseline as illustrated in Table 1. The mean age of group A (IASTM) was $28.92 + / - 7.81$ years and that of group B (MFR) was $30.71 + / - 7.87$ years. Analysis of the data was done using the Statistical Package for the Social Sciences (SPSS v26.0) software with α set at 0.05. Within the group analysis using the Wilcoxon signed rank test, it revealed statistically significant improvement in both the groups (Tables 2(A) and 2(B)). Between groups analysis using the Mann–Whitney U test revealed a significant difference between both the groups for NPRS, which showed greater improvements with IASTM. Analysis for all the other outcome measures showed no significant difference between the two groups (Table 3). The mean differences of change in scores in all the variables are plotted on a graph (Fig. 2).

Table 1. Demographic data and baseline values.

	GROUP A: IASTM	GROUP B: MANUAL MFR
	Mean ± SD	Mean ± SD
Age	28.92 ± 7.81	30.71 ± 7.87
Gender: Male/ female	2/14	2/14
Maximum NRS during activity	6.07 ± 1.54	6.5 + / − 1.6
Pre-treatment NRS at the time of evaluation	5.21 ± 1.62	4.35 + / − 2.06
PPT T1	15.51 ± 4.46	15.20 + / − 4.46
PPT T2	15.91 ± 4.29	14.79 + / − 4.07
PPT T3	15 ± 4.61	12.95 + / − 4.57
Flexion	47 ± 10.37	46.57 + / − 6.34
Lateral flexion	35.42 ± 5.94	35.78 + / − 6.32
NDI	28.10 ± 10.54	31.28 + / − 9.32

Table 2(A). Within group analysis of Group A.

	Pre	Post	p value
Maximum NRS on activity	6.07+/−1.54	2.35 + / − 0.92	0.001
NRS at the time of evaluation	5.21+/−1.62	1.64 + / − 1.08	0.001
PPT T1	15.51 + / − 4.46	20.61 + / − 6.86	0.001
PPT T2	15.91 + / − 4.29	20.74 + / − 4.40	0.001
PPT T3	15.00 + / − 4.61	20.63 + / − 6.65	0.001
Flexion	47 + / − 10.37	52.28 + / − 8.25	0.002
Lateral flexion	35.42 + / − 5.94	43.85 + / − 4.53	0.001
NDI	28.10 + / − 10.54	17.84 + / − 6.64	0.001

Table 2(B). Within group analysis of Group B.

	Pre	Post	p value
Maximum NRS on activity	6.5 + / − 1.6	4.07 + / − 1.38	0.001
NRS at the time of evaluation	4.35 + / − 2.06	2.14 + / − 1.52	0.002
PPT T1	15.20 + / − 4.46	19.42 + / − 5.56	0.001
PPT T2	14.79 + / − 4.07	19.19 + / − 3.76	0.001
PPT T3	12.95 + / − 4.57	18.92 + / − 5.90	0.001
Flexion	46.57 + / − 6.34	51.28 + / − 5.95	0.003
Lateral flexion	35.78 + / − 6.32	43.28 + / − 5.84	0.001
NDI	31.28 + / − 9.32	22.03 + / − 6.50	0.001

Table 3. Between group analysis.

	Change in Group A	Change in Group B	p value
Maximum NRS on activity	3.7 + / − 1.32	2.42 + / − 1.15	0.011
NRS at evaluation	3.57 + / − 1.15	2.21 + / − 1.52	0.008
PPT T1	5.09 + / − 3.80	4.21 + / − 3.53	0.491
PPT T2	4.82 + / − 2.73	4.4 + / − 2.25	0.491
PPT T3	5.63 + / − 3.54	5.97 + / − 3.74	0.713
Flexion	5.28 + / − 3.89	4.71 + / − 4.54	0.591
Lateral flexion	8.42 + / − 4.97	7.5 + / − 4.12	0.623
NDI	10.26 + / − 5.37	9.24 + / − 3.68	0.836

Discussion

Effect on pain

The change in the pain intensity scores (NRS on activity and at the time of evaluation) was significant in both groups. There was a significant difference between both the groups for improvement in pain on activity ($p = 0.011$) and pain at the time of evaluation ($p = 0.008$) where greater improvement was seen in the IASTM group.

The results of this study are consistent with a study done by Soumik Basu *et al.* in 2020 where they compared the effects of IASTM and ischaemic compression on upper trapezius trigger points in badminton players and found that IASTM was more effective than ischaemic compression to reduce pain.[28]

IASTM and manual MFR both techniques intend to release facial adhesions, scar tissue or tightness within the musculotendinous unit.[21]

The analgesic effects achieved by MFR and IASTM can be explained by activation of pain gate mechanism which predicts that the faster and larger A beta fibres carry touch and proprioception and have an inhibitory effect on T cells lymphocytes.[1,21,29]

Another mechanism of pain relief can be explained by a study done by Portillo Soto *et al.* comparing blood flow changes with IASTM and massage demonstrated that both the techniques increased skin temperature which indicates an increased blood flow which in turn stimulates nutrients and oxygen supply to the tissues. Reduction in the pain might be due to the removal of waste products as a result of increased circulation.[30,31]

For manual MFR, Kerr *et al.* proposed a theory that said the touch has the ability to re-normalize the cortical somatosensory central pathways that add to the painful perception in chronic pain.[32] When manual MFR is applied with deep continuous pressure to the skin and muscle, there is a decrease in the level of substance P which is one of the primary pain activators.[22] Decrease in cortisol

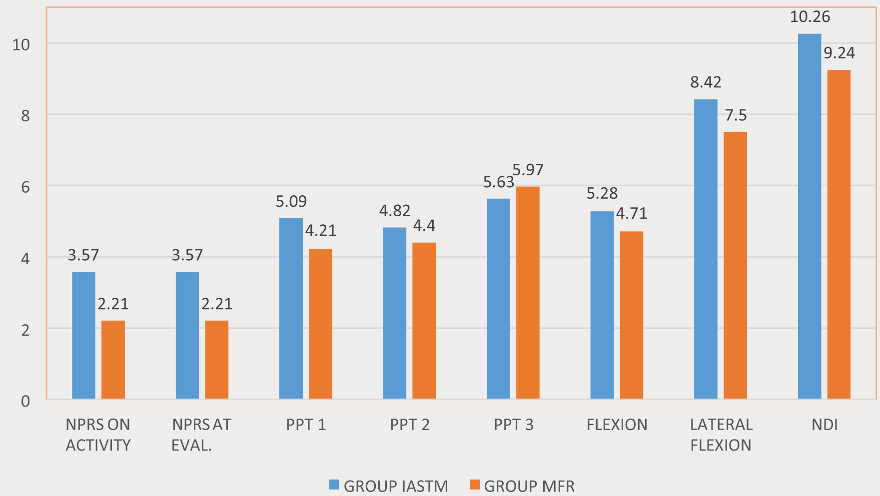


Fig. 2. Graph showing comparison between the groups for the mean change in the pre- and post-intervention data of all the outcome measures.

levels and increase in serotonin and dopamine levels have also been reported to cause pain reduction after manual MFR.[31]

The use of focused stretch technique in the current study is supported by a study conducted by Pooja Mane *et al.* in 2017 in which they compared the effects of focused stretch MFR technique and deep transverse friction massage on upper trapezius and found that focused stretch was more effective in improving the pain.[7]

IASTM increases fibroblast proliferation and also demonstrates its increased effectiveness to realign the tissue of chronic injury and thus contributes to end the pain cycle.[22]

At the same time, it is important to keep in mind that since NPRS is a subjective outcome measure there is always a chance of bias as the scores are self-reported by the participants. Since the participants were aware of their group allocation they might have an influence towards the IASTM tool as it might seem like a newer technique to them.

Effect on pain pressure threshold

The change in the PPT scores measured using a pressure algometer for three separate trigger points (T1, T2, and T3) in the upper trapezius muscle was significant within both the groups. There was no significant difference between the groups for improvement in PPT at trigger points T1, T2, and T3.

Trigger point release following ischaemic compression is caused due to reactive hyperemia at the trigger point region, counter irritant effects or a spinal reflex mechanism for causing relief of muscle spasm.[1] The mechanism for increased PPT following IASTM may be a reduction in cell matrix adhesions within an MTrP.[33,34] IASTM induces tissue micro trauma to elicit a local inflammatory response that promotes breakdown of scar tissue, release of adhesions, synthesis of new collagen, and connective tissue remodelling.[16]

The use of MFR for trigger points is supported by Manuel Rodrigues Hugert *et al.* who investigated the efficacy of MFR therapy for improving PPT and pain in patients with mechanical neck pain. PPT over trapezius and sub occipital muscles improved more significantly with MFR than when compared to a physiotherapy multimodal program.[11]

The effects obtained with IASTM are consistent with a study conducted by Gulick *et al.* in 2017 to determine if IASTM influences the PPT of an MTrP and concluded that a 5 min intervention using three IASTM techniques on upper trapezius can effectively increase the PPT of an MTrP in six treatment sessions over a period of three weeks.[23]

Effect on range of motion

A significant improvement in the range of motion for flexion and opposite side lateral flexion was seen within both the groups. There was no significant difference between the groups for improvement in range of motion of flexion and opposite side lateral flexion of the cervical spine.

Draper *et al.* demonstrated the importance of increased tissue temperature for reducing tissue stiffness. Reduced tissue stiffness can be a cause of increased range of motion. In our study, increased tissue temperature was achieved using moist hot packs and both the soft tissue mobilization manoeuvres, manual, and instrument assisted.[35]

Reduced pain leads to release of involuntary muscle contraction and muscle guarding which can be attributed to the increase in range of motion.[1]

Laudner *et al.* (2014) conducted a study using Graston technique of IASTM on posterior shoulder muscles and demonstrated an increase in the range of motion on glenohumeral internal rotation and horizontal adduction.[36]

Effect on disability

The neck disability index showed significant improvement within both the groups. When compared between the groups, there was no statistical difference found.

There exists a strong correlation between pain, stiffness, loss of mobility, fatigue, emotional or social economic or psychosocial factors that influences physical functional impairment. Decrease in pain and improvement in the range of motion in both the groups may be the reason of decrease in neck disability.[37]

The results of our study are consistent with a case report done by Zeynab *et al.* in 2018 that evaluated the effect of IASTM on active trigger points of upper trapezius and muscle fibre changes and they concluded that six sessions of IASTM when performed on alternate days reduces the pain intensity, increases the PPT and reduces the NDI. A study done by Rodrigues *et al.* in 2016 also found significant improvement in NDI after five sessions of MFR therapy in subjects with occupational mechanical neck pain.[38,39]

Along with IASTM and manual MFR, both the groups were given the same protocol of hot pack, stretching, strengthening exercises, and cold pack. The effect of this protocol in both the groups also contributes to the explanation for pain relief and improvement in function obtained.

A study done by Chaudhary *et al.* in 2013 showed the effectiveness of both MFR and cold pack along with scapular retraction exercises and cervical active movement exercises in reducing pain and improving range of motion in subjects with trapezius spasm.[40]

Cryotherapy after the treatment can help in reducing pain and controlling residual inflammation in the tissues. It prevents secondary hypoxic injury in the cells and also helps in controlling muscle soreness and petechiae.[15]

Ylinen *et al.* in 2007 recommended upper trapezius stretching to reduce neck pain, improve PPT, and improve mobility.[41] Muscle stretching reduces the excitability of motor nerve pools which in turn reduces the muscle tone, pain and ischaemia, and releases the taut bands.[1,42] The importance of release of taut bands to break the cycle that induces ischaemic contractions and perpetuates MPS is well demonstrated.[3]

Thermotherapy which was given in the form of moist hot pack is also a reason for the improvements observed as it is a well-recommended treatment for MTrPs. It causes increase in circulation, relaxation of the muscles, and reduces tension on the MTrPs.[1]

Thus, both the techniques were effective individually in improving pain, PPT, functional disability, and mobility. However, when compared to each other, there was no statistical difference between the two techniques except for pain which was better improved with IASTM.

Similar results were reported in a study done by Swati Paranjpe *et al.* in 2020 where they compared manual MFR versus IASTM on levator scapulae in patients with chronic neck pain.[31] Another study done by Vijay Kumar *et al.* in 2019 on calf pain showed effectiveness of both IASTM and compressive MFR.[43]

The results of our study are partially consistent with a meta-analysis done on chronic low back pain comparing effects of IASTM and manual MFR. They concluded that both the techniques were equally effective to reduce pain although improvement in disability was significantly greater with IASTM compared to hands on MFR.[22]

IASTM and manual MFR have their own advantages and disadvantages.[31]

In manual MFR, human touch can elicit relaxation, provide feedback in pressure and procedure based on tactile information and patient feedback.[22] It does not need availability of any instrument. However, it imposes a lot of stress on the clinician's hand and is a time-consuming technique.[31]

Availability of the instrument and training for its use are prerequisites for delivering IASTM technique.[31] IASTM is an aggressive technique but can find exact areas of restrictions, allows for deeper penetration, and also improves the mechanical advantage and reduces the stress imposed on the therapist's hand. Also, it is given for a shorter duration and hence it is time efficient.[22,36]

Thus, we conclude that IASTM and manual MFR both are effective individually as treatment procedures for pain, PPT, range of motion, and function. Neither of the treatment options can be considered better that the other. The clinician can decide based on the availability of the instrument, training, patient's preference and his/her comfort whether which of the two treatment methods should be used.

Limitations

This study had a few limitations which include the following:

- Lack of long-term follow up of the participants.
- Retention of the improvements achieved was not assessed.
- The sample size was small, leading to reduced statistical power.
- NPRS being a subjective outcome measure is associated with the risk of bias.
- There may be an interaction between the treatment effects of MFR/IASTM and other treatments given i.e., hot and cold packs and exercises.

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Conflict of Interest

The authors declare that there is no conflict of interest relevant to this study.

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Author Contributions

Study design and project management was done by Shweta Agarwal, Nilima Bedekar, Ashok Shyam, and Parag Sancheti. Data collection was done by Shweta Agarwal.

Data analysis, manuscript writing, and revision of this paper were carried out by Shweta Agarwal and Nilima Bedekar.

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