

A Comparative Study of Instrument Assisted Soft Tissue Mobilization Versus Myofascial Release for the Treatment of Mechanical Neck Pain in Dentists

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ABSTRACT

Background: Mechanical neck pain (MNP) is a prevalent occupational health concern among dentists due to sustained postures and repetitive movements. Instrument-Assisted Soft Tissue Mobilization (IASTM) and Myofascial Release (MFR) are widely used techniques for managing MNP, but their comparative effectiveness remains unclear.

Objective: To evaluate and compare the effectiveness of IASTM with an exercise program versus MFR with an exercise program in improving pain, cervical range of motion (ROM), posture, and disability in dentists with MNP

Participation Information and Methods A total of 72 dental practitioners (aged 20–40 years) with mechanical neck pain were recruited via purposive sampling and randomly assigned to Group A- IASTM + therapeutic exercises and Group B- MFR + therapeutic exercises. Interventions were conducted every alternate day for two weeks. Outcome measures included Numeric Pain Rating Scale (NPRS), Neck Disability Index (NDI), Craniovertebral Angle (CVA), and cervical ROM.

Results- Both groups showed significant improvements ($p < 0.001$) in pain, ROM, Craniovertebral Angle and functional ability. IASTM demonstrated superior pain reduction (NPRS: 0.86 ± 0.68) compared to MFR (1.25 ± 0.60 , $p = 0.013$). Whereas no significant differences were found in ROM, posture, or NDI between the groups ($p > 0.05$).

Conclusion- IASTM and MFR are equally effective in improving range, posture and functional outcomes, with IASTM showing a slight advantage in pain relief. Future studies should explore long-term efficacy and can also compare effectiveness with Ergonomic Training on neck pain..

Keywords: *Instrument-Assisted Soft Tissue Mobilization, Myofascial Release, Work-Related Musculoskeletal Disorders, Pain Management in Dentistry, Rehabilitation Strategies*

1. INTRODUCTION

Mechanical neck pain is characterized by discomfort arising from musculoskeletal structures, including muscles, ligaments, and intervertebral discs. It is often classified as a work-related musculoskeletal disorder (WRMSD), which can develop due to repetitive micro-trauma and sustained fixed postures are common in dental practice. Research indicates that approximately 70% of individuals experience neck pain at some point in their lives, but this figure is notably higher among dental professionals due to the specific demands of their work environment (1).

The dental profession is inherently demanding, combining physical precision with prolonged mental focus. Studies reveal alarmingly high prevalence rates of MNP among dentists globally. For instance, a review highlighted that up to 85% of dentists in certain regions have experienced neck pain during their careers (2). This widespread issue has substantial

implications for individual well-being and professional efficacy, leading to decreased productivity, increased absenteeism, and potential career limitations (2,3). This finding aligns with other research indicating that dental professionals are at a higher risk for WRMSDs compared to other health care workers (4).

Neck pain is a common occupational hazard among dentists. This issue stems primarily from the static postures and repetitive movements required during dental procedures, which place considerable strain on the cervical spine and surrounding musculature (5). Research highlights that up to 65% of dentists report chronic neck pain, significantly impacting their physical well-being and professional performance (6). The persistent physical stress associated with dentistry also predisposes practitioners to postural misalignments, such as forward head posture (FHP) and rounded shoulder posture (RSP), which exacerbate neck discomfort and limit functional capacity (5). To combat these occupational challenges, rehabilitation strategies for dentists with neck pain have evolved to encompass two primary approaches: therapeutic exercises and ergonomic interventions. Therapeutic exercise routines play a pivotal role in mitigating pain and restoring functional capacity. (5) Complementary to therapeutic exercises, ergonomic interventions aim to modify the working environment and promote optimal body mechanics during dental procedures (5). Despite the availability of these interventions, a substantial proportion of dentists remain unaware of the preventive measures that can mitigate their risk of musculoskeletal disorders. The need for effective, evidence-based interventions to manage neck pain has driven interest in innovative therapeutic techniques like Instrument-Assisted Soft Tissue Mobilization (IASTM).

IASTM employs ergonomically designed instruments to enhance soft tissue mobility, reduce pain, and regain function. This technique has gained prominence for its ability to address soft tissue restrictions, including adhesions and myofascial dysfunctions, which are often implicated in neck pain (7). Unlike traditional manual therapy, IASTM enhances the clinician's ability to identify and treat specific areas of soft tissue dysfunction with precision (8). IASTM creates controlled micro-trauma in the targeted tissues, which stimulates a localized inflammatory response. This process, in turn, promotes the proliferation of fibroblasts and enhances collagen synthesis, aiding in tissue regeneration and repair (9,10). Moreover, IASTM has been shown to enhance proprioceptive feedback and improve neuromuscular control, which are essential for the restoration of normal function (11). Localized hyperaemia induced by IASTM enhances vascularization, accelerating the resolution of inflammation and promoting tissue recovery (12). Commonly used techniques include sweeping, fanning, and swivelling, which involve applying longitudinal and multidirectional strokes along muscle fibers to release restrictions (13).

Myofascial Release (MFR) has proven to be a beneficial treatment for patients suffering from neck pain, especially those with chronic conditions. This technique helps alleviate pain, enhance function, and restore normal range of motion by targeting myofascial restrictions. Research indicates that MFR significantly reduces pain as well as disability in individuals suffering from chronic trapezitis. The study highlighted the technique's effectiveness in decreasing pain as measured by the Visual Analogue Scale (VAS) and improving functional outcomes assessed by the Neck Disability Index (NDI) (9). The therapeutic effects of MFR can be attributed to its impact on the fascia, a viscoelastic tissue that plays a crucial role in mechanical force transmission and structural support. When subjected to trauma or chronic stress, fascia can become stiff and lose its pliability, leading to pain and restricted movement. MFR helps restore the normal consistency of the fascia by applying sustained, gentle pressure and stretching techniques. One study explain that MFR facilitates a change in the ground substance of the fascia from a gel-like state to a more fluid state, reducing tension and restoring proper alignment (14).

Previous studies have independently showcased the success of MFR and IASTM in managing mechanical neck pain. However, there is limited evidence directly comparing both techniques to evaluate their impact specifically on dentists, who are prone to neck pain due to sustained bending postures in their profession.

The core objective of this study was to determine the efficacy of IASTM integrated with an exercise program compared to MFR integrated with an exercise program in dentists experiencing neck pain due to sustained fixed postures during their clinical practice

2. METHODOLOGY

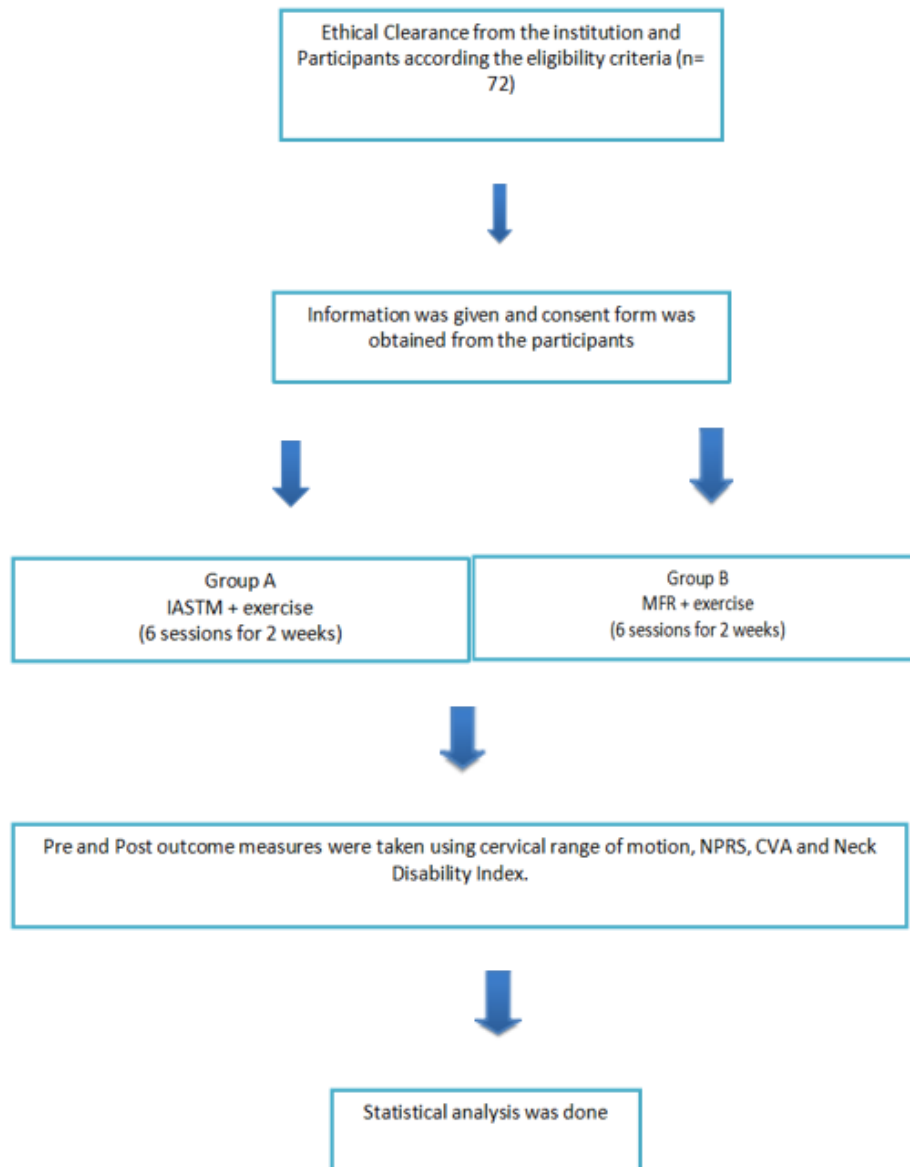
The present study follows an experimental design and was conducted at Dr. D. Y. Patil College of Physiotherapy, Pune. The target population comprised of dental practitioners, with the sample population specifically including those experiencing mechanical neck pain. A purposive sampling method was employed, with a total sample size of 72 participants.

Participants were included if they were dentists aged between 20 to 40 years, of either gender, and had been diagnosed with mechanical neck pain by an orthopedician. Additionally, participants exhibited unilateral pain referral and restricted neck rotation and side flexion range of motion. However, individuals were excluded if they had a history of recent head or neck surgery, ankylosing spondylitis, skin sensitivity, open wounds, local infection, or cervical fracture.

INTERVENTION

Ethical approval for the study was granted by the Institutional Ethical Committee. A total of 72 participants meeting the eligibility criteria were recruited. Prior to participation, written informed consent was obtained from all individuals.

Participants were randomly assigned to Group A or Group B using the envelope method, ensuring a simple random sampling process. The study's purpose was thoroughly explained to all participants, and any queries were addressed by the therapist. Pre- and post-intervention assessments were conducted using the following outcome measures: NPRS, NDI, Cervical ROM (measured with a goniometer), and CVA for head and neck posture evaluation.



Group A: Participants in Group A was treated with IASTM along with standard therapy. During the treatment, the patient was seated comfortably on a chair, and a lubricant was applied to the targeted area. The IASTM tool was given at an angle of 30° to 60° for 40 to 120 seconds, until hyperaemia (increased blood flow) was observed. To minimize hyperaemia, ice packs were applied post-treatment. The technique involved sweeping the instrument over the muscle belly in a parallel direction, targeting the upper trapezius, suboccipital muscles and levator scapulae while the patient remained in a seated position. Each session lasted 35 minutes, conducted every alternate day for two weeks, with the IASTM device facilitated by friction-free oil or gel for smooth application.

Group B – Subjects will receive myofascial release and exercise followed by cold pack, every alternate day for 2 weeks.

IASTM TECHNIQUE:

Before initiating treatment, a friction-free oil or gel was applied to the skin around the neck for lubrication, & the IASTM instrument was carefully sanitized with an alcohol pad. The tool was then utilized to detect restricted areas within the affected

muscles. Using a 45-degree angle, slow and controlled strokes were administered along the muscle fibers. Once an adhesion was identified, repeated strokes were applied for five minutes to target the restricted area. The M2T Blade, a recent advancement in IASTM, was utilized for precision and effectiveness.

For Levator scapulae- The participant was positioned in a seated posture, with the head slightly tilted towards the affected side. A small amount of lubricant was applied to the skin, and the IASTM instrument was used to assess and mobilize restrictions along the levator scapulae. The strokes were applied in both directions along the muscle length, maintaining a 45-degree angle to the skin. If the participant experienced any discomfort beyond a localized sensation of pressure, pull, or stretch, the pressure was reduced to ensure patient comfort and safety.



For upper trapezius- The participant was seated comfortably in a chair for the procedure. Before beginning treatment, A lubricant was applied to the neck area to aid in identifying restricted regions

Within the upper trapezius. The IASTM tool was positioned at a 45-degree angle, and slow, controlled strokes were administered along the muscle, following its path from origin to insertion using the sweeping technique. The strokes were applied for approximately three minutes, ensuring the treatment remained comfortable and pain-free.



For Suboccipital muscle- The subject was in a sitting position. Instrument was applied for 20 seconds in a direction parallel to muscle fibres at a 45-degree angle to the suboccipital muscle.



Procedure in Group B:

Myofascial release- All participants were seated during the application of the technique and were provided with a detailed explanation of the procedure, including any potential risks. Multiple maneuvers were incorporated into each treatment session, with each maneuver being performed once per session using a gradual and controlled application of light force. The treatment protocol was administered over a period of two weeks, consisting of six sessions, with each session lasting within 30 minutes.



Myofascial Release Technique on a subject for levator scapulae muscle during the study



Myofascial Release Technique on a subject for suboccipital muscle during the study



Myofascial Release Technique on a subject for upper trapezius muscle

Stretching: It was done for levator scapulae muscle and upper trapezius muscle. The stretch was sustained for 30 seconds with 3 repetitions each.

Isometric Exercises- The intensity of isometric exercises was adjusted from light to strong based on the patient's tolerance. It was done for neck side flexors and rotators.

3. RESULTS

Graph 1: Comparison between post mean values of numeric pain rating scale in group A and B

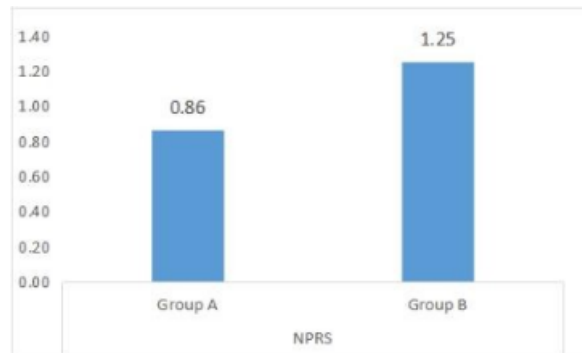


Table 1: Comparison between post mean values of numeric pain rating scale in group A and B

Variables		Mean	Std. Deviation	Std. Error Mean	P Value
NPRS	Group A	0.86	0.683	0.114	0.013
	Group B	1.25	0.604	0.101	

Graph 2: Comparison between post mean values of neck disability index scale in group A and B



Table 2: Comparison between post mean values of neck disability index scale in group A and B

Variables		Mean	Std. Deviation	Std. Error Mean	P Value
NDI	Group A	1.97	1.207	0.201	0.052
	Group B	2.53	1.183	0.197	

Graph 3: Comparison between post mean values of craniovertebral angle in group A and B

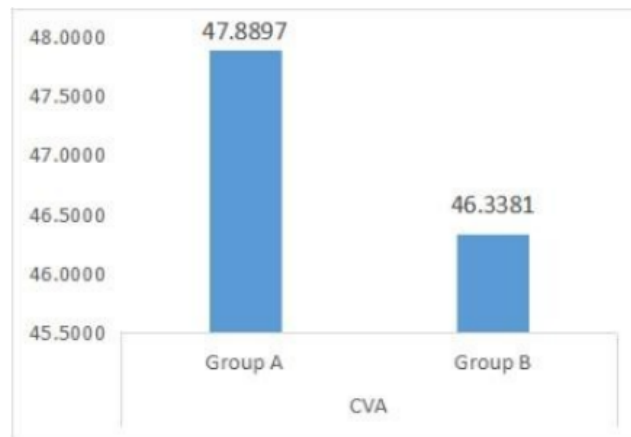


Table 3: Comparison between post mean values of craniovertebral angle in group A and B

Variables		Mean	Std. Deviation	Std. Error Mean	P Value
CVA	Group A	47.8897	3.63069	0.60511	0.076
	Group B	46.3381	3.68911	0.61485	

Graph 4: Comparison between post mean values of side flexion in group A and B

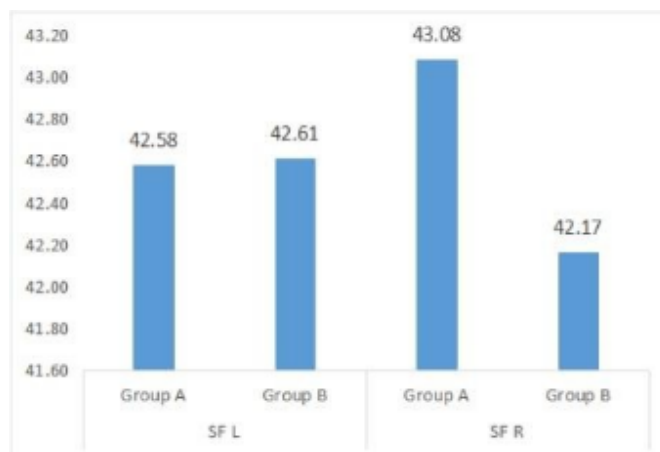


Table 4: Comparison between post mean values of side flexion in group A and B

Variables		Mean	Std. Deviation	Std. Error Mean	P Value
SF L	Group A	42.58	2.183	0.364	0.956
	Group B	42.61	2.032	0.339	
SF R	Group A	43.08	1.933	0.322	0.057
	Group B	42.17	2.091	0.348	

Graph 5: Comparison between post mean values of rotation in group A and B

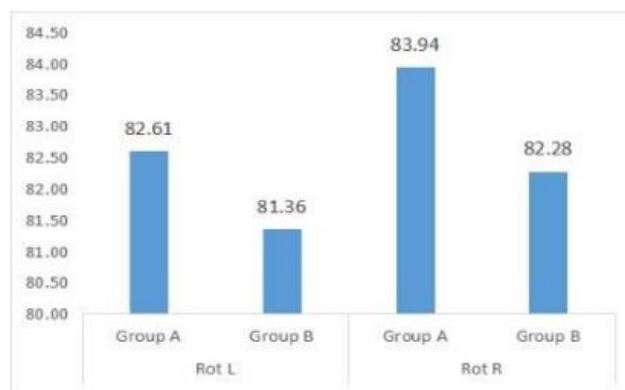


Table 5: Comparison between post mean values of rotation in group A and B

Variables		Mean	Std. Deviation	Std. Error Mean	P Value
Rot L	Group A	82.61	4.080	0.680	0.249
	Group B	81.36	5.004	0.834	
Rot R	Group A	83.94	4.276	0.713	0.054
	Group B	82.28	2.804	0.467	

The study included 72 dental practitioners with mechanical neck pain, divided into two groups: Group A, which received IASTM and exercise, and Group B, which received MFR and exercise. The mean age of participants in Group A was 27.8 years, while in Group B, it was 27.1 years. The gender distribution was comparable, with 16.6% males and 83.3% females in Group A, and 19.4% males and 80.5% females in Group B.

Within-Group Comparisons:

Pain Intensity (Numeric Pain Rating Scale - NPRS)

Both groups demonstrated a significant reduction in pain levels. In Group A, the mean NPRS score dropped from 8.00 ± 0.83 to 0.86 ± 0.68 ($p < 0.001$). Similarly, Group B showed a decrease from 7.72 ± 0.61 to 1.25 ± 0.60 ($p < 0.001$). This indicates a marked reduction in pain for both groups following intervention.

Functional Disability (Neck Disability Index - NDI)

Significant improvements were observed in functional disability scores. In Group A, the NDI decreased from 13.17 ± 3.26 to 1.97 ± 1.20 ($p < 0.001$). In Group B, the NDI score reduced from

12.78 ± 3.12 to 2.53 ± 1.18 ($p < 0.001$). These results suggest that both interventions effectively reduced neck-related disability.

Postural Improvement (Craniovertebral Angle - CVA)

Both groups exhibited a significant improvement in the craniovertebral angle (CVA), indicating improved forward head posture (FHP). In Group A, the CVA improved from $40.89 \pm 5.22^\circ$ to

$47.88 \pm 3.63^\circ$ ($p < 0.001$). Likewise, Group B experienced an improvement from $41.35 \pm 3.93^\circ$ to

$46.33 \pm 3.68^\circ$ ($p < 0.001$).

Cervical Range of Motion (ROM - Side Flexion & Rotation)

- Side Flexion: Group A showed improvements in left side flexion from $36.11 \pm 6.60^\circ$ to

$42.58 \pm 2.18^\circ$ and right side flexion from $37.69 \pm 4.91^\circ$ to $43.08 \pm 1.93^\circ$ ($p < 0.001$). Similarly, Group B improved from $37.22 \pm 5.04^\circ$ (left) and $37.50 \pm 4.50^\circ$ (right) to $42.61 \pm 2.03^\circ$ (left) and $42.17 \pm 2.09^\circ$ (right) ($p < 0.001$). Rotation: Group A demonstrated an increase in left cervical rotation from $64.00 \pm 16.99^\circ$ to $82.61 \pm 4.08^\circ$ and right cervical rotation from $67.64 \pm 13.91^\circ$ to $83.94 \pm 4.27^\circ$ ($p < 0.001$). In comparison, Group B

improved from $64.89 \pm 14.64^\circ$ (left) and $67.78 \pm 12.56^\circ$ (right) to $81.36 \pm 5.00^\circ$ (left) and

$82.28 \pm 2.80^\circ$ (right) ($p < 0.001$).

Between-Group Comparisons

Pain Reduction (NPRS): The post-treatment NPRS values revealed that Group A experienced greater pain reduction (0.86 ± 0.68) compared to Group B (1.25 ± 0.60), with a statistically significant difference ($p = 0.013$), as depicted in Graph 1 and Table 1.

- NDI Reduction: Group A (1.97 ± 1.20) and Group B (2.53 ± 1.18) showed no statistically significant difference ($p = 0.052$), indicating comparable effects on disability, as represented in Graph 2 and Table 2.
- Postural Improvement (CVA): No significant difference was observed between groups (p

$= 0.076$), as illustrated in Graph 3 and Table 3.

- Cervical ROM:
 - Side Flexion: The comparison between groups showed no statistically significant difference ($p = 0.956$ left, $p = 0.057$ right), confirming that both interventions were equally effective, as seen in Graph 4 and Table 4.
 - Rotation: Group A ($82.61 \pm 4.08^\circ$ left, $83.94 \pm 4.27^\circ$ right) and Group B ($81.36 \pm 5.00^\circ$ left, $82.28 \pm 2.80^\circ$ right) showed no significant difference ($p = 0.24$ left, $p = 0.054$ right), as depicted in Graph 5 and Table 5.

Intragroup analysis was performed using the paired t-test, while intergroup analysis was conducted using the unpaired t-test.

4. DISCUSSION

The finding of this study indicate that both IASTM and MFR are effective in alleviating pain and enhancing functional outcomes in dentists experiencing mechanical neck pain.

The results showed that both IASTM and MFR significantly reduced pain as assessed by NPRS. However, intergroup analysis revealed that IASTM demonstrated a slightly greater reduction in NPRS scores compared to MFR. This finding aligns with research conducted by Shukla et al., which highlighted the efficacy of IASTM in addressing myofascial adhesions and improving tissue elasticity through controlled microtrauma. The mechanical stimulation provided by IASTM tools

enhances local circulation, breaks down fibrous adhesions, and facilitates tissue remodeling, leading to immediate and sustained pain relief (8,9).

In contrast, MFR achieves pain reduction by applying sustained, gentle pressure to restricted fascia, restoring its pliability and decreasing tension on pain-sensitive structures. Studies such as those by Shewail et al. have reported similar improvements in pain outcomes using MFR, particularly for patients suffering with chronic mechanical neck pain. While the mechanism of pain relief differs between the two techniques, both appear to target the underlying causes of pain, including myofascial restrictions and trigger points, with comparable efficacy (8).

The Neck Disability Index (NDI) scores showed marked improvements in both groups, indicating enhanced functional capacity following intervention. This finding is consistent with previous studies, such as Paranjape and Lad, which reported significant functional gains with both manual soft tissue mobilization and IASTM in patients with chronic neck pain. Improvements in NDI scores suggest that both techniques effectively reduce muscle stiffness, enhance range of motion (ROM), and alleviate the functional limitations associated with mechanical neck pain (13).

A study conducted by Shukla et al. (2020), found that while IASTM was effective in alleviating pain in patients with chronic upper trapeziitis, both IASTM and MFR were equally effective in improving disability. The comparable effects on disability may be attributed to MFR's broader impact on overall tissue pliability and alignment, which contributes equally to functional recovery. These results reinforce the notion that both techniques can be effectively incorporated into rehabilitation programs for mechanical neck pain (9).

Forward head posture, a frequent result of prolonged neck flexion and poor ergonomics, is commonly assessed using the CVA. In this study, both IASTM & MFR showed significant improvements in CVA, indicating correction of FHP. The results aligning with findings from Aggarwal et al., where IASTM significantly improved postural alignment and reduced FHP in participants with text neck syndrome. By releasing fascial restrictions and enhancing muscle flexibility, IASTM helps restore the natural cervical curvature, which is critical for reducing strain on the cervical spine (7).

Myofascial release works by targeting fascial restrictions, which are often responsible for postural imbalances and movement limitations. In forward head posture (FHP), the anterior neck muscles become tight and overactive, while the posterior neck and upper back muscles weaken. MFR techniques, such as cranial base release help alleviate tension in these tight structures, allowing the head to realign over the shoulders (15).

Cervical ROM is a vital measure of functional recovery in neck pain management. The study results demonstrated notable improvements in cervical rotation and lateral bending in both groups. This finding aligns with Mahmood et al., who reported enhanced ROM in patients with upper crossed syndrome following IASTM interventions. The biomechanical effects of IASTM, including increased tissue elasticity and reduced stiffness, contribute to these improvements. Enhanced ROM facilitates better neck mobility, allowing dentists to perform their tasks more efficiently and with less discomfort (12).

MFR improves the flexibility and elasticity of the fascia surrounding cervical muscles, reducing stiffness and allowing for greater active cervical motion. The article supports this by showing that MFR led to significant improvements in active cervical range of motion (side bending and rotation), indicating enhanced mobility (15).

Dentists are at an elevated risk of developing mechanical neck pain due to sustained postures, repetitive neck flexion, and ergonomic challenges inherent in dental practice. This study emphasizes the significance of integrating targeted therapeutic approaches like IASTM and MFR into the treatment strategies for this population. Both techniques offer significant benefits in reducing pain and improving functional ability, enabling dentists to maintain their professional productivity and quality of life (9,13).

The slight edge observed with IASTM in pain reduction may make it a preferred choice in scenarios where immediate pain relief is a priority. However, the hands-on nature and broader tissue effects of MFR also make it a valuable tool, particularly in settings where specialized instruments for IASTM are not available. Combining these techniques with ergonomic interventions, such as posture correction and workstation adjustments, may further enhance their effectiveness and provide long-term relief for dental professionals (8).

The mechanisms underlying the effectiveness of IASTM and MFR are distinct yet complementary. IASTM utilizes ergonomically designed tools to apply controlled pressure and strokes over restricted tissues. This process induces a localized inflammatory response, which stimulates fibroblast proliferation, collagen synthesis, and tissue remodeling. Additionally, IASTM improves proprioceptive feedback and neuromuscular control, further aiding in pain reduction and functional restoration (8,9).

Conversely, MFR targets the fascia, a viscoelastic connective tissue that encases and supports muscles. Through the application of sustained pressure, MFR helps restore the fascia's normal viscosity, reducing excessive pressure on pain-sensitive structures like blood vessels and nerves.

This technique also enhances lymphatic and vascular flow, contributing to pain relief and functional improvement (8,13).

While both IASTM and MFR demonstrated significant benefits, the slightly greater efficacy of IASTM in pain reduction may be attributed to its precision and ability to target specific adhesions and trigger points. However, the overall similarity in functional outcomes indicates that the selection of technique can be customized based on the patient's individual needs, the therapist's expertise, and the availability of resources. This finding is supported by Shewail et al., who observed no significant differences between the two techniques in terms of pain and functional improvement, despite minor clinical advantages of IASTM (8).

5. CONCLUSION

This study demonstrates that both IASTM and MFR both are effective in alleviating pain and disability among dentists with mechanical neck pain. While clinically IASTM may offer greater pain relief because of local counter irritant effect, both techniques provide comparable functional benefits, making them viable options for managing work-related musculoskeletal disorders. Integrating these therapies into comprehensive rehabilitation programs, including ergonomic modifications and exercise regimens, can enhance their effectiveness and support the long-term well-being of dental professionals.

Limitations:

Short Duration: The intervention period of 2 weeks might not capture the long-term effects of IASTM and MFR on mechanical neck pain.

Homogeneous Population: The study focuses only on dentists aged 20-40 years, which may not reflect the experiences of older or younger dental professionals.

Limited Scope of Outcomes: The study primarily examines pain, ROM, CVA and disability but does not explore psychosocial factors or work satisfaction, which can also influence outcomes.

Lack of Long-Term monitoring: The absence of post-intervention follow-up makes it difficult to assess the sustainability of the treatment effects over time.

FUTURE SCOPE OF THE STUDY

Future research can focus on the long-term effects of IASTM and MFR to assess their sustained efficacy and recurrence rates of neck pain. Additionally, exploring the psychosocial and ergonomic factors influencing neck pain in dentists could enhance understanding beyond physical interventions. Studies integrating ergonomic training programs alongside IASTM and MFR may provide insights into their combined effectiveness. The use of emerging technologies such as real-time motion analysis or virtual reality could improve assessment and treatment precision. Lastly, expanding research to other healthcare professionals with similar work-related musculoskeletal disorders may offer a broader perspective on these interventions.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interests

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