EFFECT OF INSTRUMENT-ASSISTED SOFT TISSUE MOBILIZATION ON TRIGGER POINTS OF TENSION HEADACHE

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ABSTRACT

Tension headache is a bilateral headache of pressing or tightening quality that causes disability and substantial pain that is linked with considerable cost and a high burden. This research was conducted to investigate the impact of instrument-assisted soft tissue mobilization on trigger points of tension headache. Thirty patients with tension headache contributed to the study. Cases were recruited from the physical therapy department of the National Institute of Neuromotor system. Cases randomly were categorized into 2 equal number groups: Group (A) traditional treatment, group (B) received instrument-assisted soft tissue mobilization in addition to traditional treatment. Measurement variables were visual analog scale for pain intensity, neck disability index for function disability, pressure algometer for pressure pain threshold (PPT), and headache frequency. These variables evaluated pretreatment and after four weeks post treatment. The finding results were that Group B is statistically significantly increased in all outcome variables (pain intensity, headache frequency, neck disability index and pressure pain threshold) over group (A), where (P=.0.0001).The most prominent conclusion were that Instrument-assisted soft tissue mobilization is more effective than traditional physical therapy to improve pain, functional ability, and pressure pain threshold in cases with tension headaches.

Keywords: Tension Headache, Myofascial trigger point, Instrument-assisted soft tissue mobilization.

I. INTRODUCTION:

Headache is one of the top ten most disabling conditions per the World Health Organization (WHO) ranking of disability reasons [1]. Approximately 46% of the general population has an active headache disease. The most common primary headache is tension-type headache (TTH), primary headaches contribute to considerable reductions in specific domains of health-related life quality [2].

TTH is divided into three subtypes based on attack frequency: an infrequent episodic form, in which headaches occur 1 day or less per month on average, a frequent episodic form in which headaches occur between 1 to 14 days per month for at least 3 months and a chronic form with 15 or more headache days per month.

Headache are further subdivided based on the presence or absence of pericranial tenderness [3].Causes of Tension Headache concluded in the hypothesis that central sensitization underlies frequent tension-type headache is supported by evidence of increased peripheral muscle tenderness and muscle hardness in individuals with tension-type headaches [4].

Myofascial Trigger Points are highly prevalent in patients with tension-type headache [5]. Etiology of myofascial pain is multifactorial including poor ergonomic and body biomechanics, acute or repetitive trauma, excessive or
no exercise and vitamin deficiency\[6\]. Other factor contributing to develop of MtrPs include psychological factor such as high job pressure, psychological stress and anxiety\[7\].

Some characteristics of tension type headache, such as pressure or band-like tightness and increase tenderness on palpation of neck and shoulder muscles, resemble the descriptions of referred pain from trigger points. Within the cervical musculature, there are several head and neck muscles, eg, upper trapezius, temporalis, sternocleidomastoïs, suboccipital muscles, etc., from which TrPs spread referred pain to the head.\[8\]

The previous treatment of tension-type headache includes the following, myofascial release, neck muscle trigger point in the cervical thoracic muscle, stretching, superficial heat, massage progressive muscle relaxation, pressure release, muscle energy technique and mobilization of the thoracic and cervical spine.\[9\]

Instrument-assisted soft tissue mobilization, or simply (IASTM), is a unique type of tool that enables doctors to find and treat cases with soft tissue dysfunction effectively. IASTM is getting more popular rapidly because of its efficiency and effectiveness while maintaining non-invasive.\[10\] IASTM Enhanced fibroblast proliferation, increased vascular response, decreased scar tissue and adhesions, and the remodeling of disordered collagen fiber matrix. Additionally, it has been demonstrated that the IASTM technique resulted in clinical benefits like the increased range of motion, perception of pain following treatment, and strength\[6\].

Instrumental assisted myofascial release consists of several friction types of techniques depending on the use of specific instruments. Instrumental utilization myofascial release differs from other soft tissue techniques by implementation specialty instruments to apply greater pressure\[11\]. Compared to a clinician’s bare hands, the contact area of the IASTM instrument is significantly less, which is thought to lead to increased tensile and compressive stress. The skin deformation may lead to decreased activities of both large and small fiber neurons, which may in turn provide a form of analgesic response.\[12\]

Much of the existing literature surrounding the management of headache has focused on pharmacology with a smaller emphasis on the role of allied health, such as physiotherapy\[15\]. Within available literature, there is a gap in the literature concerning the effect of instrument assistive soft tissue mobilization on tension type headache. The aim of this study was to determine the effect of instrument assistive soft tissue mobilization on upper trapezius trigger point and suboccpital trigger point on pain level and functional disability in tension type headache.

II. SUBJECT AND METHOD:

Study design: this study designed as single blind randomized control trial study. It was conducted in the National institute of Neuronotor system from January to June 2021.

Selection of cases and Randomization: cases with Tension headache were recruited from the physical therapy department of the National Institute of the Neuromotor system. Thirty participant were assigned randomly into 2 equal groups. Group A was 15 cases, and Group B was 15 cases. The randomization was simple by using numbered opaque envelopes containing treatment allocation. The patient’s enrollment flow chart, fig. 1.

Assessment for eligibility (n=40)
**Inclusion Criteria:**

Patients age ranged between 30 to 40 years \(^{[13]}\), BMI between 18 to 25 kg /m\(^2\), TTH criteria, according to the Headache Classification Committee of the International Headache Society (HIS 2018) \(^{[14]}\), has at least 2 of the following features: Headache occurring on 15 days/month on average for >3 months (180 days/year), pressing/tightening quality (non-pulsating), bilateral location, not aggravated by routine physical activity, moderate or mild intensity, both of the following: no more than one of photophobia, phonophobia or mild nausea, neither moderate or severe nausea or vomiting. Patients have Trigger points in sub occipital muscle and upper trapezius muscle at both sides right and left \(^{[8]}\).

**Exclusion criteria**

Patients with a history of malignancy \(^{[15]}\), history of cervical and cranial surgery, major psychiatric disorders (major Depression), uncontrolled hypertension \(^{[16]}\), other causes of headache, dysfunctions in the tempomandibular joint \(^{[17]}\). Headaches are associated with high fever, stiff neck or rash, problems with vision, or profound dizziness \(^{[18]}\).

**Ethical consideration:**

The Cairo University Faculty of Physical Therapy's Research Committee approved the study on an ethical basis, and the Ethical and Research Committee of the Basic science department with the number REC/12/003004: on 10/11/2020. The necessary official permission to implement the study was obtained from the manager of outpatient clinics at the National institute of Neuromotor system.

**Sample size calculation**

The G*power program 3.1.9 (G power program version 3.1, Heinrich-Heine-University, Düsseldorf, Germany) measured the sample size for this work for a one-tailed test. The calculation sample size depend on F tests (MANOVA: interactions and special effects), Type I error (\(\alpha\)) = 0.05, power (1-\(\beta\) error probability) = 0.80, Pillai V = 0. 5635860, and effect size f2 (V) = 0. 39235625 with 2 independent groups comparison for 4 major variable outcomes. This study's appropriate minimum sample size was 30 patients (15 patients in each group as a minimum).

**Assessment instrumentation**
Pressure algometer:
An algometer "Push-pull force gauge FEI" (Baseline instruments, White Plains, New York, USA). Was utilized to evaluate MTrP tenderness by evaluating the pressure pain threshold (PPT) by a pressure transducer probe that is placed on the MTrP. A pressure algometer is a valid and reliable method of assessing trigger-point sensitivity, fig 2 [19].

Fig. (2): Pressure Algometry

Visual analog scale (VAS):

The VAS is a widely utilized pain intensity assessment instrument in rehabilitation that has been shown to be valid and reliable [19]. A VAS is typically composed of a 100 mm horizontal line attached with two opposed labels; patients mark a score on the scale by a vertical line [20].

Neck disability index scale:

The NDI is a ten-item condition specific functional status questionnaire filled by patients, such as personal care, pain, reading, lifting, concentration, headaches, work, sleeping, and recreation [21].

Frequency of headache.

Headache frequency assessed after and before sessions. It was known as the number of headache days per week. The frequency of days with headaches in the past weeks was registered by the participant [22].

Procedure:

Group A received only a conventional physical therapy program. Total time 25 min: Infrared 15 min, exercise 10 minute, all patient received 3 times per week for 4 weeks, assessment was pretreatment and after the last session.

Infrared: by application on the back of the neck at a perpendicular distance which ranged from 50 to 75 cm depending on patient tolerance for 15 minutes [23].

Exercises which include: [24]

Active range-of-motion exercises for neck extension, neck flexion, neck rotation, and neck lateral flexion to both directions, that includes active movement without resistance as follow: Patient sitting on the chair, therapist standing behind the patient, asking the patient to move his neck smoothly in extension, flexion, rotation, and lateral flexion to both directions for 1 set 5 repetitions.

Stretching exercises for upper Trapezius muscles of the neck as follow: Patient sitting on the chair, Therapist standing behind the patient. Then passively moving the head to the end range and sustain with gentle pressure for 30 seconds, then relax.

Stretching exercise of Suboccipital muscle as follow: Patient sitting on the chair. Therapist standing behind the patient. Place his hands on the back of the top part of the head. Push the top of the head down and forward.

Strengthening exercises for neck muscles in form of isometric exercises as follow: Patient sitting on the chair, therapist standing behind the patient, then asking the patient to push his head against maximum resistance, holds 7 sec 3 sets each set 10 repetitions and relaxes 1 min without movement [25].
Group B received IASTM and conventional therapy. Total time 30 minutes: 15 min infrared, 5 min instrument-assisted soft tissue mobilization, 10-minute exercises, all patient received 3 times per week for 4 weeks, assessment was pre-treatment and after the last session.

Assessment of trigger points

The assessment of right and left upper trapezius trigger point1(right-t1, left-t1), right and left suboccipital trigger points (right-s, left-s), were detected according to a diagnostic criteria on for MTrPs proposed by Simons et al [26]: there is a palpable taut band., there is a hypersensitive area, snapping palpation causes a local twitch reaction., in response to the stimulus, the normal referred pain pattern is reproduced, The presence of the typical referred pain pattern and pain alleviated by elongating (stretching) the muscle or by injecting the tender spot.

Instrument assisted soft tissue mobilization application

M2T Blade we used for soft tissue mobilization (YC INOX 304 INFORM –Taiwan), prior to treatment, a lubricant (Vaseline) were utilized to the skin around the neck, and the M2t blade was disinfected with an alcohol pad. To begin, the M2T blade was used to determine the precise locations of muscle limitation in affected muscles. Then, with the M2T blade at a 45-degree angle to perform slow strokes along with the muscle. The clinician identify the changes in soft tissue consistency via the instrument's vibrations as it slides across irregular connective tissue fibrosis regions. After identifying an adhesion, strokes were repeated for 5 minute, Fig 3 [27].

![M2T Blade](image)

Fig. (3):M2T Blade

Data collection

The data were tested for normality and variance homogeneity. The Shapiro-Wilk method was conducted to test the data normality, which indicated that the data were distributed normally (P>0.05) after outliers were removed using whiskers plots and box. Moreover, Levene's test for testing the variance homogeneity revealed that there was no significant difference (P>0.05). So, the data are distributed normally, and parametric analysis was done.

Statistical analysis

The statistical analysis was carried out via the SPSS Package for Windows version 25. (SPSS, Inc., Chicago, IL). For demographic data, the mean and standard deviation were used (weight, age, BMI, and height). The independent t-test was performed to compare demographic data variables between the two groups. MANOVA is a statistical technique which is utilized to compare the investigated major variables of interest across different test groups and determining periods. A mixed design 2 x 2 MANOVA-test was utilized; the first independent variable (between-subject factors) was the tested group with 2 levels (group A and group B). The second independent variable (within-subject factor) was measuring periods with 2 levels (pre-and post-treatment). Bonferroni correction test was utilized to compare between pairwise between and within groups of the tested variables, that F was significant from the MANOVA test. All statistical analyses were significant at the probability level less than an equal 0.05 (P ≤ 0.05).

III. RESULTS:

In the current study, a total of 30 patients participated and they were distributed randomly into 2 groups (15 patients/group).

There was no statistically significant differences in demographic data for age (P=0.062), weight (P=0.877), height (P=0.534), and BMI (P=0.765) between traditional treatment group and instrument assisted soft tissue mobilization group (Table1).
Table 1: The demographic data comparison between group A and group B.

<table>
<thead>
<tr>
<th>Items</th>
<th>Groups</th>
<th>t-value</th>
<th>P-value</th>
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<tbody>
<tr>
<td></td>
<td>Group A (n=15)</td>
<td></td>
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<tr>
<td></td>
<td>Group B (n=15)</td>
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<td></td>
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<tr>
<td>Age (year)</td>
<td>36.67 ±4.18</td>
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<td></td>
<td>33.73 ±3.26</td>
<td>1.141</td>
<td>0.062</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>66.47 ±5.28</td>
<td></td>
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<tr>
<td></td>
<td>66.73 ±4.00</td>
<td>0.156</td>
<td>0.877</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>165.33 ±2.92</td>
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<td></td>
<td>164.53 ±3.96</td>
<td>0.630</td>
<td>0.534</td>
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<tr>
<td>BMI (kg/m2)</td>
<td>24.31 ±1.46</td>
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<td></td>
<td>24.65 ±1.04</td>
<td>0.302</td>
<td>0.765</td>
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</tbody>
</table>

Quantitative data are demonstrated as mean ± standard deviation (SD), and categorical data are expressed as number (percentage). P-value: probability value. P-value>0.05: non-significant.

Multiple pairwise comparison tests (Post hoc tests) for variables VAS, NDI, and headache frequency indicated that within each group there were statistically significant decreased post-treatment compared to pre-treatment (P=0.0001). Within group A and group B, respectively Multiple pairwise comparison tests (Post hoc tests) for VAS score, NDI, and headache frequency between both groups indicated no statistically significant differences at pre-treatment in VAS score (P=0.545), NDI (P=0.676), and headache frequency (P=0.661) (Table 2).

Table 2: Comparison of pre-and post-treatment VAS scores, NDI, and frequency between both groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Items</th>
<th>Groups (Mean ±SD)</th>
<th>Mean difference</th>
<th>F-value (between groups)</th>
<th>P-value (between groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group A</td>
<td>Group B</td>
<td></td>
<td></td>
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<tr>
<td>VAS</td>
<td>Pre-treatment</td>
<td>6.26 ±0.86</td>
<td>6.45 ±0.96</td>
<td>0.19</td>
<td>0.370</td>
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<tr>
<td></td>
<td>Post-treatment</td>
<td>4.34 ±0.72</td>
<td>2.29 ±0.90</td>
<td>2.05</td>
<td>41.47</td>
</tr>
<tr>
<td></td>
<td>Mean difference</td>
<td>1.92</td>
<td>4.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F-value(within group)</td>
<td>36.50</td>
<td>171.34</td>
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<tr>
<td></td>
<td>P-value(within group)</td>
<td>0.0001*</td>
<td>0.0001*</td>
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<tr>
<td>NDI</td>
<td>Pre-treatment</td>
<td>21.07 ±2.18</td>
<td>21.40 ±2.34</td>
<td>0.33</td>
<td>0.177</td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>15.53 ±2.41</td>
<td>9.47 ±1.64</td>
<td>6.06</td>
<td>58.55</td>
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<tr>
<td></td>
<td>Mean difference</td>
<td>5.54</td>
<td>11.93</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>F-value(within group)</td>
<td>48.71</td>
<td>226.55</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>P-value(within group)</td>
<td>0.0001*</td>
<td>0.0001*</td>
<td></td>
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</tr>
<tr>
<td>Frequency</td>
<td>Pre-treatment</td>
<td>4.73 ±1.03</td>
<td>4.60 ±0.91</td>
<td>0.13</td>
<td>0.195</td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>2.83 ±0.69</td>
<td>1.73 ±0.59</td>
<td>1.10</td>
<td>13.26</td>
</tr>
<tr>
<td></td>
<td>Mean difference</td>
<td>1.90</td>
<td>2.87</td>
<td></td>
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<tr>
<td></td>
<td>F-value(within group)</td>
<td>39.58</td>
<td>90.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P-value(within group)</td>
<td>0.0001*</td>
<td>0.0001*</td>
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</tbody>
</table>

Data are demonstrated as mean ± standard deviation (SD). MD: Mean difference. P-value: probability value. * Significant (P<0.05).

Multiple pairwise comparison tests (Post hoc tests) for right upper trapezius trigger point 1 (right –t1), right suboccipital trigger point (right-s), left upper trapezius trigger point 1 (left –t1), and left suboccipital trigger point (left-s) variables within each group revealed that there were statistically significantly increased (P<0.05) at post-treatment compared to pre-treatment within group A and group B. Multiple pairwise comparison tests (Post hoc Tests) for these variables between both groups indicated no statistically significant differences at pre-treatment in right-t1 (P=0.165), right-s (P=0.12), left-t1(P=0.559),and left-s (P=0.667) (Table 3).

Table 3: Comparison of pre- and post-treatment right upper trapezius trigger point 1, right suboccipital, left upper trapezius trigger point 1, and left suboccipital between both groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Items</th>
<th>Groups (Mean ±SD)</th>
<th>MD</th>
<th>F-value (between groups)</th>
<th>P-value (between groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>right-t1</td>
<td>Pre-treatment</td>
<td>1.31 ±0.29</td>
<td>1.14 ±0.24</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Myofascial trigger points causes pain, tenderness, muscle tightness, fiscal restrictions, neck pain, headache and muscle stiffness in the muscles[29,30,31,32]. MTPS are provoking pain to any stimuli weather direct or indirect stimulation resulting in referred pain, tenderness and involuntary dysfunction in most cases[29]. Previous studies suggested that application of Trigger point release on active TrPs was effective for reducing the frequency and duration of the headache and medication intake[30,31,32].

The result of current study showed that there were statistically significantly decreased in VAS scores, NDI and headache frequency and statistically significantly increase in pressure pain threshold at post-treatment compared to pre-treatment within traditional treatment group and IASTM group. This significant decrease in post-treatment VAS score, NDI, and headache frequency and statistically significantly increase in PPT more favorable of IASTM group than traditional treatment group.

Pathophysiology of trigger point was caused by injured or overloaded muscle fibers, according to which could result in endogenous and involuntary shortening, loss of oxygen and nutrition delivery, and increased metabolic demand on nearby tissues. Pathophysiologic defects in trigger points are explained by a variety of theories. These include end plate abnormalities and increased acetylcholine release, chronic local ischemia, and inflammatory chemical substances (e.g., histamine, prostaglandins, bradykinin and serotonin) that induce nociceptive sensitization and chronic pain[39].

The refinement that occurred when applying IASTM might come from its ability to induce tissue micro-trauma. Thus, resulting in the regional inflammatory process and increasing release of fibroblast. The fibroblast migration increases collagen synthesis and tissues regeneration that speeds up healing process. In addition, increasing tissue temperature and blood flow due to friction between tool and tissue may contribute to improving tissue oxygenation and removal of local waste metabolites [33,34]. The IASTM may have stimulated the A-beta sensory fibers to block the A-delta and C-fibers. As per the “gate control theory” of pain management, as long as the sensory fibers are firing, the “gate” to the transmission of pain is “closed.” This blocks the substance P from the pain receptors via presynaptic inhibition at the dorsal horn [38].

IASTM showed a statistically significant reduction in pain at rest and on activity in cases neck pain. Several researchers reported a decrease in neck pain post IASTM [36,37].

This study is agreement with Motimath et al [38] who investigated the effect of IASTM by using m2t blade on pain level measured by VAS in trapezius myofascial trigger points. This study showed the statistically significant effect of IASTM by using M2t blade on decreasing pain level. Lee et al [40] showed that there was improvement in

<table>
<thead>
<tr>
<th></th>
<th>Post-treatment</th>
<th>Mean difference</th>
<th>F-value (within group)</th>
<th>P-value (within group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>right-s</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pre-treatment</td>
<td>1.28 ±0.25</td>
<td>1.00 ±0.25</td>
<td>0.18</td>
<td>2.49</td>
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<tr>
<td>Post-treatment</td>
<td>1.74 ±0.28</td>
<td>2.37 ±0.41</td>
<td>0.63</td>
<td>30.52</td>
</tr>
<tr>
<td>left-t1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>1.14 ±0.24</td>
<td>1.21 ±0.36</td>
<td>0.07</td>
<td>0.34</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>1.57 ±0.32</td>
<td>2.41 ±0.40</td>
<td>0.84</td>
<td>45.388</td>
</tr>
<tr>
<td>left-s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>1.14 ±0.31</td>
<td>1.08 ±0.35</td>
<td>0.06</td>
<td>0.18</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>1.52 ±0.39</td>
<td>2.33 ±0.43</td>
<td>0.81</td>
<td>33.89</td>
</tr>
</tbody>
</table>

Data are demonstrated as mean ± standard deviation (SD)  
MD: Mean difference  
P-value: probability value  
* Significant (P<0.05)
function post IASTM, decrease in NDI scores may be attributed to decrease in pain. IASTM causes improvement in muscle activity level due to pain reduction.

The findings of this study are congruent with the results achieved by Lilian et al[^39] who investigated the effect the myofascial trigger points release versus exercises therapy in the treatment of chronic cervical myofascial pain dysfunction syndrome. They found that each of the pain intensity, the neck disability index, and the range of motion of active neck side bending were more statistically significantly improved due to the effect of myofascial trigger point’s pressure release.

Gulick[^40] who concluded that 5-min intervention using three IASTM techniques can effectively increase the PPT of an MTrP in six treatments over a three-week period of time, he recommended that IASTM are performed in combination with other modalities and/or therapeutic exercise.

Bendtsen et al[^4] used deep tissue massages and muscle energy stretching techniques in treatment the tight muscles. Chronic tension headache can lead to a buildup of collagen fibers where tendons and ligaments attach to the bones of head and neck. These fibers do not contract and are hard and stiff. The presence of collagen fibers can result in physical deformity, discomfort, pain, and a decrease in joint function, which can all trigger more tension headaches. Deep tissue massage can be used to break up the collagen fibers located around cervical vertebrae, which can alleviate the stress they placed on muscles and joints.

After the completion of IASTM, stretching and muscle strengthening exercises targeting the treated area must be performed to strengthen the treated tissue and realign the collagen. Also, Stretching exercise can relax the spammed muscle. It acts on viscoelastic properties of muscle fibers and induces relaxation. By applying constant external load slowly on shortened muscle, this leads to deformation and increases flexibility of the target muscle[^41].

Previous paper which claimed that manual therapy combined with another technique is more effective than manual therapy alone. Espi-López mentioned in her literature review article that manual therapy combined with cervical muscle stretching is more effective than operating each technique alone[^42].

The findings of this study disagreement with[^35] who reported no impact of the Graston IASTM approach in the treatment of upper-back MTrPS when compared to a control group. These differences could be addressed by the type of IASTM technique used as well as methodological issues (application type and time).

**Limitation of this study:**

This study was limited to the female gender. Also it did not investigate the long-term effects of the used treatment.

**Recommendation**

Further studies should be conducted to show the long-term effect, further studies should be conducted on different ages and gender.

**Acknowledgment**

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**REFERENCES**

Fernández-de-Las-Peñas C, Ge HY, Arendt-Nielsen L, Cuadrado ML, Pareja JA. Referred pain from trapezius muscle trigger points shares similar characteristics with chronic tension type headache. European Journal of Pain. 2007 May 1; 11(4):475-82.


Williams M. Comparing pain and disability outcomes of instrumental versus hands on myofascial release in individuals with chronic low back pain: a meta-analysis (Doctoral dissertation, California State University, Fresno).


Senthilnathan, C., Gurulakshmi, A., & Kumar, G. M. Effects of isometric neck exercises in improving cervical range of motion in long time helmet wearers, 2015. 9-16.


Bunn L. The Effects of Graston Technique in the Treatment of Soft Tissue Dysfunction.


