SHOCK WAVE THERAPY VERSUS INTEGRATED NEUROMUSCULAR INHIBITION TECHNIQUE IN UPPER TRAPEZIUS MYOFASCIAL TRIGGER POINTS

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Abstract

Background: Myofascial trigger points in the upper trapezius (MTrPs) have recently become a prevalent complaint as a result of stressful daily repetitive work scenarios experienced by students. Investigating the effects of shockwave therapy combined with a neuromuscular inhibition approach on trigger points in the upper trapezius is the focal point of this academic work.

Methods: This academic work encompassed 63 cases, with ages ranging from 18 to 30, of both sexes. Three categories were formed at random. Group A (Control) has gone through a 12-session (three-weekly) course of traditional physical therapy. Group B (study) has received conventional physical therapy protocol in addition to Integrated Neuromuscular Inhibition 3 times/week for 4 consecutive weeks. Group C (study) has obtained shock wave therapy on the upper trapezius myofascial trigger point in addition to traditional physical therapy. Three times at a one-week interval, the participants did SWT. Pain intensity, pain pressure threshold, cervical range of motion, and functional disability were assessed using the Visual Analogue Scale, Pressure Algometer, Cervical Inclinometer, and Neck Disability Index.

Results: Pre-treatment between-groups study revealed no clear disparity between any of the three groups. In terms of VAS score, group C markedly improved after therapy compared to groups A and B both immediately following treatment and at the follow-up one month later ($p = 0.0001$). PPT increased noticeably more in group C than in groups A and B both immediately following treatment and during the follow-up one month later ($p=0.0001$). In terms of the range of motion, group C clearly improved when compared to groups A and B in terms of neck flexion, extension, right and left rotation, and left-side bending ($p=0.0001$), however, there was no marked disparity between the three groups in terms of right-side bending. In terms of NDI, there was no discernible variation in NDI between groups A, B, and C prior to, after, and one month afterward ($p > 0.05$).

Conclusion: In terms of pain intensity level, pressure pain threshold, cervical range of motion, and function ability level for the upper trapezius myofascial trigger point patients, SWT shows more improvement than the integrated neuromuscular inhibition technique.

Keywords: Shock Wave Therapy; Integrated Neuromuscular Inhibition Technique; Upper Trapezius Myofascial Trigger Points

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1. INTRODUCTION

Myofascial Trigger Points (MTrPs) are a defining feature of the regional pain syndrome known as Myofascial Pain Syndrome (MPS). It is a palpable, taut ring of skeletal muscle that can affect distant motor and autonomic functions and convey pain [1-4]. MTrps appears to frequently influence the upper fibers of the trapezius muscle, which are the most sensitive to an algometer's pressure and are responsible for pain attacks in roughly 85% of people [5]. Shockwave has been shown to be effective in reducing pain and improving clinical outcomes in MPS cases in a number of studies [2] [5-9].

Muscle energy methods (MET), ischemia compression (IC), and strain-counterstain (SCS) are components of the Integrated Neuromuscular Inhibition approach (INIT), a manual therapy approach [10]. It was decided that it was successful in treating MTrPs by lowering stiffness, easing discomfort, and enhancing functional capacity [1,10,11][12]. Recent research suggests that shock wave therapy is a useful technique for treating MPS as well as several musculoskeletal conditions, including plantar fasciitis, calcific tenosynovitis, and nonunion of pseudoarthrosis or fractures [13].

Numerous studies have demonstrated that both SWT and INIT are effective in MPS, significantly reducing pain [1, 3, 7, 10, 11, 13, 16]. However, there is disagreement in the literature regarding which of them is superior, so this study was conducted to compare the impact of SWT versus INIT on pain intensity, pressure pain threshold level, cervical range of motion, and level of neck functional disability in patients with upper trapezius myofascial trigger points.

2. PATIENTS AND METHODS

The current academic work compared the impact of INIT versus SWT on pain intensity, pressure pain threshold level, cervical range of motion, and neck functional disability level in patients with upper trapezius myofascial trigger points at Heliopolis University, Cairo, Egypt, from September 2021 to July 2022.

- **Design of the study**

A randomized controlled experiment including pre-, post-, and follow-up assessments was used to develop this study.

- **Participants**

With ages ranging from 18 to 30 years old, active myofascial trigger points in the upper trapezius muscle, and chronic Pain lasting more than 12 weeks, 63 participants of both sexes (36 girls and 27 men) participated in this study [10]. Following Simons and Travel's criteria, MTrPs were identified and symptoms triggered by movement-maintained neck posture, or examination of the upper trapezius muscles [14], as well as by other factors [15,16]. Every participant had a medical examination conducted by a blind examiner.

If a participant met any of the following criteria, they were disqualified from the study: neck pain brought on by whiplash injuries, history of cervical spine surgery, cervical radiculopathy or myelopathy, physical therapy within the three months prior to the study, history of tumor, fracture, metabolic diseases, rheumatoid arthritis, osteoporosis, cervical disc herniation, Fibromyalgia syndrome, neck pain accompanied by vertigo brought on by vertebrobasilar insufficiency or accompanied by non-cervicogenic headaches and psychiatrist disorders and TMJ disorders [17].

- **Sample size calculation**

The sample size was calculated using G*Power software (updated version 3.1.9.4). The effect size of the VAS (main outcome variable) was 0.65, the type I error rate was fixed at 5% (alpha-level 0.05), and the type II error rate was fixed at 90% power.

- **Randomization**

Using blinded randomization and numbered envelopes for allocation concealment, 63 cases of both sexes with active myofascial trigger points in the upper trapezius muscle were divided into three groups (A, B, and C). This was done using the SPSS program.

- **Ethical Statements**

Before initiating the study, each case submitted an informed consent. Every participant had the option to leave the study at any point during the protocol procedure. The Faculty of Physical Therapy at Cairo University, Egypt's ethical committee gave the study the go-ahead (NO: P. T. REC/012/003353). The Pan African Clinical Trial Registry received the research registration. Registration number: IDPACTR20220287562991.

INSTRUMENTATIONS TOOLS

Instrumentations and Tools for measurements

- **Visual Analogue Scale**

The VAS, which consisted of a line, typically 10 cm long, ranging from no pain or discomfort (zero) to the greatest agony that may potentially feel (10), is thought to be a legitimate and reliable scale to evaluate pain intensity level. As both ends of the line are defined in terms of the most extreme levels of pain experience, it offers a continuous scale [18]. It is also regarded as one of the best techniques for determining the degree of discomfort [19].

- **Pressure Algometer**

A computerized technology called pressure algometry is used to gauge a person's pain threshold. The greatest amount of pressure, before it becomes painful, is the one that can be tolerated. The patient's pain threshold, which needed an exceptionally low force level to induce pain, was quantified by measuring the pressure at myofascial trigger sites [5,20,21]. High validity and a range of 0.4 to 0.98 in terms of inter-rater reliability may be found in the pressure algorithm. the technique was explained to the participants by having them experience the algometer's sensation on an unaffected body area. It was utilized before, after, and one month later [22].

- **Bubble inclinometer**

In order to calculate cervical ROM, it is used. Both an indication and a rotating scale are present. By comparing the machine's status profiles, the bubble inclinometer was calibrated before being used. This means that the position 1 reading will be stored in memory, spin the inclination under 180 degrees, and be placed in the same location [23]. Allow 10 seconds to pass. The indication and scale's zero points are lined up at the initial measurement, making it simple to read the change in angle at the subsequent measurement [24]. Active motions of the cervical spine are reliable between testers [25].

- **Neck Disability Index**

It is a scale used to assess neck pain-related self-reported disability. A higher score of 5 indicates a significant loss of function, and a lower score of 0 indicates no handicap. It features a two-factor, ten-item format, in which the patient chooses one sentence out of six that best characterizes their function. In this inquiry, the NDI's Arabic version was used. It is a solid and valid tool that can be utilized to assess neck discomfort in Arab patients. Therefore, it is appropriate for application in research and medicine [20, 21].

- ***Instrumentations and Tools for Treatment***

- **Shock Wave Therapy**

The current academic work made use of the Power SWIT XY-K-MEDICAL type shockwave device. With parameters of (2000 impulses, 0.1 mJ of power, and 16 Hz of frequency), it was held stationary in a perpendicular direction on trigger points in the top fibers of the trapezius muscle. A portable or tiny shock wave applicator is attached to the shock wave. Whereas the silicone rubber-based insulating skin membrane acts as a non-electrically conductive hermetic seal around the device's external housing [26].

- ***Procedures***

I. Measurement procedures

- **Pain Intensity Level**

It was made up of a 10-cm line. It was told to the patient to mark it vertically. can express how much pain they are experiencing, ranging from no pain or discomfort (zero) to the worst pain they can tolerate (ten) [18]. No pain is defined as a VAS rating of 0 to 0.4 cm, mild pain as 0.5 to 4.4 cm, moderate pain as 4.5 to 7.4 cm, and severe pain as 7.5 to 10 mm [27].

- **Pain Threshold**

The upper trapezius muscle's trigger sites' pressure pain threshold was evaluated using digital pressure algometry. Each patient was asked to identify the location of their pain, and this location was subsequently verified by pincer palpation and noted with a marker. The myofascial trigger point was treated with the transducer probe tip. By pressing the transducer firmly downward, the requisite pressure was applied to the location of the myofascial trigger points.

Each trigger point was subjected to steady pressure applied perpendicularly and gradually at a rate of around 1 kg/m2 until the patient complained of pain. The actual pressure applied at the spot, measured in pounds of force, was displayed digitally [20,21]. The PPT rating values that were utilized as a guide were as follows: 0 = no pain, 1-3 = mild, 4-6 = moderate, and 7-10 = severe pain [28].

- **Cervical Range of Motion**

The bubble inclinometer was regarded as a viable and trustworthy tool for calculating the cervical range of motion [25]. It has a movable circular dial with degree markings and a round tube that is partially filled with a colored fluid that moves with motion. It should be emphasized that during the measurements, the examiner kept the platform center of the bubble inclinometer totally locked in place on the reference point. The accuracy of the reference points' tactility is crucial. Prior to each part, it needs to be calibrated by comparing its status profiles; this demonstrated that the position 1 reading was stored in memory. After that, spin the inclination at less than 180 degrees, and set it up in the same spot [29,30].

- **Neck Functional Disability Level**

It was assessed using NDI. On a 6-point scale, 0 represents no handicap and 5 represents total disability, the questions are scored. The percentage of disability scores was determined using the numeric response for each item, which had a range of scores from 0 to 50 [31]. Scores of 10–28% were deemed mildly disabled, 30–48% were moderately disabled, 50–68% were severely disabled, and 72% or more were completely disabled [32].

II. Treatment procedure

Following a thorough explanation of the study's protocols for the cases, the therapist took careful note of each person's age, weight, height, and BMI.

Group A (control): Traditional physical therapy techniques were used in this group. These techniques included deep friction massage, home exercise programs and manual isometric strengthening exercises for cervical extension, flexion, bilateral side bending, and bilateral rotation, each of which required the patient to exert moderate resistance from their maximum strength for 10 seconds.

Group B (INIT): For four weeks in a row, Integrated Neuromuscular Inhibition Technique, which included IC, SCS, and MET, was used three times per week. The patients were put in the supine position, and the physiotherapist found the active MTrPs in the fibers of the upper trapezius. He then applied ischemic compression with a pincer grasp for 5 seconds, released for 2-3 seconds, and then applied pressure again for 5 seconds. After ischemic compression, the positional release technique was used by holding the muscle in a shortened/relaxed position.

The threshold of ease was established as the point at which pain was at least 70% lessened. To lessen the reported MTrPs pain, the patient was laying supine with the head tilted towards the affected side and the ipsilateral arm in flexion, abduction, and external rotation. After locating the position of ease, it was kept for 20–30 seconds before being repeated three–five times. Last but not least, MET was administered to the participants' implicated upper trapezius.

Each isometric contraction for shoulder elevation (autogenic inhibition) is held for 7–10 seconds before being followed by an isometric contraction for shoulder depression (reciprocal inhibition). Following this, additional contralateral side bending, flexion, and ipsilateral rotation is used to maintain the soft tissue stretch for 30 seconds, and this process is repeated three to five times per treatment session [10].

Group C (shockwave): SWT was used on trigger sites that were active in the upper fibers of the trapezius, with parameters of 2000 shock waves (EFD = 0.10 mJ/mm2), 1500 impulses on MTrPs, and 500 impulses around the taut band. In addition to receiving traditional physical therapy treatment, the participants underwent the ESWT three times at 1-week intervals (a total of 6000 shock waves). Each patient was also subjected to the chosen program for four sessions over the course of four weeks, and each patient was evaluated both before and after the sessions [6].

STATISTICAL ANALYSIS

Descriptive statistics were done for the sake of comparing the mean age (years), weight (kg), height (cm), and BMI (kg.m-2) of each category.

To compare the impact of therapy on VAS score, PPT (Kg/cm2), cervical range of motion (deg.), and NDI score, mixed MANOVA was implemented. All statistical tests had a significance threshold of $p < 0.05$. The statistical package for social studies (SPSS) version 22 for Windows (IBM SPSS, Chicago, IL, USA) was adopted to conduct all statistical analyses.

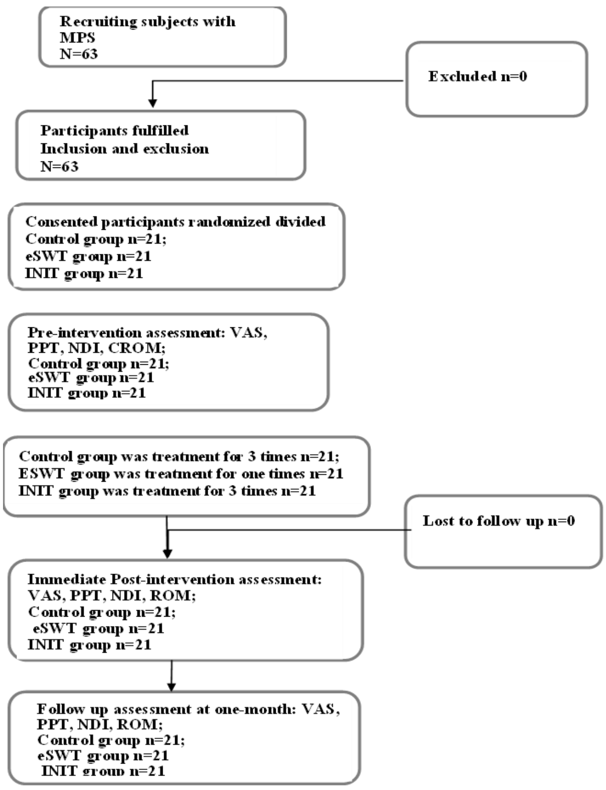

Figure (1): Flowchart of the study methodology.

3. RESULTS

➢ ***General characteristics of the participants***

Each category encompassed twenty-one cases with active MTrPs of the upper fibers of the trapezius. **Group A:** is characterized by an average (X) ± standard deviation (SD) of Age (years), Weight (kg), Height (cm), BMI (kg/m^2) of 22.15 ± 2.11 years, 60.46 ± 5.62 kg, 1.70 ± 0.05 cm and 21.01 ± 1.30. **Group B:** is defined by Avg. ± SD of age, weight, height, and BMI as, 21.77 ± 2.39 years, 58.31 ± 5.65 kg, 1.68 ± 0.06 cm and 20.62 ± 1.66 kg.m-2 respectively. Group C: characterized by Avg. ± SD of age, weight, height, and BMI were 22.15 ± 3.01 years, 60.85 ± 5.50 kg, 1.69 ± 0.05 cm, and 21.31 ± 1.45 kg/m^2 respectively. The outcomes of comparing the main properties of the three groups cleared that there was no marked disparity among the average age, weight, height, and BMI ($p > 0.05$). The gender distribution in each group showed that there were 12 females and 9 males representing 57 and 43 percent.

Effect of treatment on pain intensity level, pain Pressure threshold, range of motion, and Neck functional disability.

MANOVA test was adopted in the current academic work as demonstrated in **Tables (1)** and **(2).** The results showed statistically crystal-clear disparity among the three groups regarding VAS (cm), PPT (Kg/cm^2), flexion (deg.), extension (deg.), left side bending (deg.), right rotation (deg.), and left rotation (deg.) ($P<0.05$). There was no clear variance found between the three groups regarding NDI and right-side bending (deg.) ($P>0.05$).

Table (1): Clinical Characteristics of patient's post-treatment among three groups (A, B, and C)

Characteristics	Group A (control)	Group B (INTI)	Group C (SWT)	F-Value	P-Value
	Average ± SD				
VAS (cm)	4.0±0.19	3.97±0.18	3.83±0.17	4.84	0.01*
NDI	39.24±1.34	39.00±1.48	38.76±1.22	0.65	0.5
PPT (Kg/cm^2)	2.41±0.10	2.46±0.13	2.74±0.19	31.30	0.0001*
Flexion (deg.)	39.19±1.96	40.19±1.75	42.52±3.50	9.61	0.0002*
Extension (deg.)	39.76± 1.89	40.00± 1.84	45.00± 1.84	51.02	0.0001*
Rt side bending (deg.)	61.57±6.40	62.43±5.80	64.29±7.60	0.91	0.4
Lt side bending(deg.)	60.00±3.10	60.38±2.80	67.71±0.70	48.89	0.0001*
Rt rotation (deg.)	51.62± 2.39	52.43± 2.29	58.57± 2.37	54.65	0.0001*
Lt rotation (deg.)	53.67±2.20	53.86±1.87	59.62±2.20	56.73	0.0001*

Where: *: significant; X: Average. SD: Standard Deviation; deg. degrees; VAS: Visual Analogue Scale; NDI: Neck Disability Index; PPT: Pain Pressure Threshold; Rt side bending, Right side bending; Lt side bending, Left side bending; Rt rotation: Right Rotation; Lt rotation: Left Rotation; P, probability value. P-Value < 0.05 indicates statistical significance between the three groups.

Table (2): Clinical Characteristics of patients' follow-up treatment after the 1-month intervention period among groups

Characteristics	Group A (control)	Group B (INTI)	Group C (SWT)	F-Value	P-Value
	Average ± SD				
VAS (cm)	3.73±0.25	3.74±0.21	3.70±0.11	0.05	0.94
NDI	38.14±3.07	37.52±2.14	37.43±1.66	0.56	0.57
PPT (Kg/cm^2)	2.47±0.10	2.51±0.11	2.83±0.11	7.68	0.0001*
Flexion (deg.)	39.52±1.25	40.24±1.78	45.24±1.79	61.88	0.0001*
Extension (deg.)	40.38± 1.25	40.24± 1.78	45.24± 1.78	72.05	0.0001*
Rt side bending (deg.)	62.29±5.70	63.05±5.50	65.43±8.25	1.29	0.28
Lt side bending(deg.)	60.48±2.70	61.86±2.50	68.05±2.70	48.45	0.0001*
Rt rotation (deg.)	52.19± 1.70	52.57± 2.60	58.81± 2.20	64.81	0.0001*
Lt rotation (deg.)	54.10±1.80	55.76±2.40	61.43±3.60	41.31	0.0001*

Where: *: significant; X: Average. SD: Standard Deviation; deg. degrees; VAS: Visual Analogue Scale; NDI: Neck Disability Index; PPT: Pain Pressure Threshold; Rt side bending, Right side bending; Lt side bending, Left side bending; Rt rotation: Right Rotation; Lt rotation: Left Rotation; P, probability value. P-Value < 0.05 indicate statistical significance between three groups

Table (3): Between groups effects post treatment.

Characteristics	Group A versus Group B		Group A versus Group C		Group B versus Group C	
	MD (95% CI)	P-Value	MD (95% CI)	P-Value	MD (95% CI)	P-Value
VAS (cm)	-0.02 (-0.16, 0.12)	1	-0.14 (0.00, 0.27)	0.05*	-0.16(-0.30, -0.24)	0.016*
NDI	0.24 (-0.78, 1.26)	1	0.47 (-0.55, 1.50)	0.774	-0.24 (-1.27, 0.79)	1
PPT (Kg/cm^2)	-0.05 (-0.16, 0.06)	0.777	-0.34 (-0.45, -0.222)	0.0001*	0.28 (0.17, 0.39)	0.0001*
Flexion (deg.)	-1 (-2.92, 0.92)	0.615	-3.33 (-5.25, -1.41)	0.0001*	2.33 (0.41, 4.25)	0.012
Extension (deg.)	-0.09 (-1.51, 1.32)	1	-5.09 (-6.52, -3.67)	0.0001*	5.0 (3.58, 6.42)	0.0001*
Rt side bending (deg.)	-0.86 (-5.92, 4.20)	1	-2.71 (-7.77, 2.35)	0.575	1.86 (-3.20, 6.92)	1
Lt side bending (deg.)	-0.38 (-2.54, 1.78)	1	-7.71 (-9.88, -5.55)	0.0001*	7.33 (5.17, 9.49)	0.0001*
Rt rotation (deg.)	-0.81 (-2.60, 0.98)	0.81	-6.95 (-8.74, -5.16)	0.0001*	6.14 (4.35, 7.934)	0.0001*
Lt rotation (deg.)	-0.19 (-1.75, 1.37)	1	-5.95 (-7.52, -4.38)	0.0001*	5.76 (4.19, 7.33)	0.0001*

Where: *: Significant; deg.: degrees; VAS: Visual Analogue Scale; NDI: Neck Disability Index; PPT: Pain Pressure Threshold; Rt side bending, Right side bending; Lt side bending, Left side bending; Rt rotation: Right Rotation; Lt rotation: Left Rotation; P, probability value. P-Value < 0.05 indicate statistical significance.

Table (4): Between groups effects at follow-up treatment (1 month of intervention).

Characteristics	Group A versus Group B		Group A versus Group C		Group B versus Group C	
	MD (95% CI)	P-Value	MD (95% CI)	P-Value	MD (95% CI)	P-Value
VAS (cm)	-0.01 (-0.16, 0.14)	1	0.03 (-0.12, 0.18)	1	-0.038 (-0.18, 0.11)	1
NDI	0.62 (-1.18, 2.42)	1	0.71 (-1.08, 2.51)	0.994	-0.095 (-1.89, 1.70)	1
PPT (Kg/cm^2)	-0.05 (-0.12, 0.03)	0.48	-0.36 (-0.43, -0.28)	0.0001*	0.313 (0.24, 0.39)	0.0001*
Flexion (deg.)	-0.71 (-1.95, 0.52)	0.48	-5.71 (-6.95, -4.48)	0.0001*	5.00 (3.76, 6.24)	0.0001*
Extension (deg.)	-0.57 (-1.83, 0.67)	0.48	-5.57 (-6.83, -4.31)	0.0001*	5.00 (3.74, 6.26)	0.0001*
Rt side bending (deg.)	-0.76 (-5.78, 4.26)	1	-3.14 (-8.17, 1.88)	0.386	2.38 (-2.64, 7.40)	0.743
Lt side bending (deg.)	-1.38 (-3.40, 0.64)	0.291	-7.57 (-9.59, -5.55)	0.0001*	6.19 (4.17, 8.21)	0.0001*
Rt rotation (deg.)	-1.05 (-2.75, 0.66)	0.406	-7.28 (-8.99, -5.58)	0.0001*	6.24 (4.53, 7.94)	0.0001*
Lt rotation (deg.)	-1.67 (-3.75, 0.42)	0.16	-7.33 (-9.42, -5.25)	0.0001*	5.67 (3.58, 7.75)	0.0001*

Where: *: Significant; deg.: degrees; VAS: Visual Analogue Scale; NDI: Neck Disability Index; PPT: Pain Pressure Threshold; Rt side bending, Right side bending; Lt side bending, Left side bending; Rt rotation: Right Rotation; Lt rotation: Left Rotation; P, probability value. P-Value < 0.05 indicate statistical significance.

4. DISCUSSION

The goal of the current study was to assess the short- and long-term (measured as one month) effects of treatment with SWT versus INIT on patients with active MTrPs in the upper fiber of the trapezius. According to the current study's findings, treatment with SWT or INIT lessens pain both immediately following treatment and at the 1-month follow-up. The potential of INIT to cause tissue micro trauma, which stimulates fibroblast migration and, in turn, collagen synthesis, tissue regeneration, and a modest increase in tissue temperature, is thought to be the cause of the reduction in pain intensity level [33].

As shockwaves penetrate the layers of the muscles and reach depths that cannot be reached by INIT hand pressure, this reason for decreasing pain intensity level relates to SWT more than INIT [34].

In terms of VAS score, the findings of the present study were consistent with those of **Ji et al.'s** (2012) investigation into the effects of SWT on pain relief following four therapies over a period of 15 days in patients with upper trapezius myofascial pain syndrome, as there was a significant decrease from 4.9±11.76 to 2.27±1.27 in the treated group ($p<0.01$) compared to the control group [5].

Additionally, when **Eftekharsadat et al.** (2020) examined the effects of SWT and corticosteroid trigger point injection (TPI) on pain relief at the four-week follow-up time point, participants in the SWT group saw a 30% reduction in pain compared to the corticosteroid TPI group [35]. As **Saadat et al.** (2018) investigated INIT in patients with upper trapezius trigger points and discovered improvement in the INIT group in reducing pain intensity immediately after treatment (P =.01) and 24 hours after treatment (P =.009) in comparison to the control group, the current study was also in agreement with that study [36].

Regarding PPT, group B and group C had substantially higher pain pressure threshold levels than group A both immediately following treatment and during the follow-up one month later (p=0.0001). The release of the muscle's involuntary contraction in each group might be interpreted as the cause of the elevated PPT [12].

According to the current study's findings, treatment with INIT or SWT improved range of motion (ROM) when it came to neck flexion, extension, right and left rotation, and left side bending both immediately following treatment and at follow-up one month later as compared to the control group. Additionally, both for immediate effects and the follow-up in ROM of the neck, the improvement in Group SWT was superior to that in INIT [37].

The current study's findings concurred with those of a study by **Albomahmood et al.** (2022), which examined the impact of using both SWT and (MET) on pain relief on active trigger points of the upper trapezius muscle. They recommended that SWT with MET is a more suitable and effective method for treating MTrPs because changes in ROM in the combined group before and after the intervention were clearly different from those in the MET group ($P<0.001$).

The study conducted by **Sibby et al.** (2022), which compared the effectiveness of INIT and LASER with stretching in treating upper trapezius trigger points, was consistent with the current study because it discovered a significant improvement in cervical range of motion in the INIT group (p = 0.012) in comparison to the control group [11]. The lack of a significant difference in right-side bending in the current investigation, in contrast to the left-side, can be attributed to the fact that most individuals used their right hands more frequently during the treatment period than their left hands-on average.

Evidence of the Effect of Shock Wave Therapy

According to the manufacturer, the shock wave gadget is highly and quickly effective in treating trigger points [39]. The results of a SWT treatment program, according to the data analysis in the current study, showed a noticeable improvement both immediately after treatment and after one month in pain reduction, raising the pain threshold to pressure, improving cervical range of motion related to the right trapezius and ROM of flexion, extension, left side bending, right rotation, and left rotation, and improving in neck function level.

In a study conducted by Mushtaq, **Pattnaik, and Mohanty** (2017), the findings showed that both groups of subjects with myofascial trigger points in the upper trapezius muscle experienced decreased pain perception as measured by VAS, increased pressure pain threshold, and increased contralateral neck side flexion range of motion. On the VAS, there was no discernible difference between the groups in terms of pain reduction; however, SWT group improvement in PPT and CROM was significantly greater than ischemia compression [9].

The quantitative VAS reductions, however, were hardly noticeable. These findings were in line with those made by **Ji et al.** (2012), who found that following four sessions of ESWT treatment (0.056 mJ/mm^2, 1000 impulses) for MTrP, the VAS considerably dropped in the intervention group from 4.91±1.76 to 2.27±1.27 [28]. The positive effects of ESWT were of particular concern because long-term pain relief was more likely due to enhanced angiogenesis, increased blood flow to ischemic tissue, and higher tissue oxygen saturation, whereas immediate effects could be caused by hyperstimulation and temporary dysfunction of synapse transmission.

Previous research has shown that shock wave energy, which is highly concentrated, can reduce pain by damaging unmyelinated sensory nerve fibers [40–42]. Further, **Takahashi et al.** (2006) noted that the cumulative effects of repeated SWT on nerve fibers were superior to those of a single section or application [32].

Evidence of the effect of INIT

The effect of INIT, which included IC, SCS, and MET, directly deal with muscle trigger point and aid in their deactivation [43]. IC aims to slow down blood supply and then produce reactive hyperemia that relieves pain and muscle tension (muscle spasm) by reducing the sensitivity of painful nodules and normalizing the length of sarcomeres in the affected MTrPs [10,12,44].

The findings of the INIT treatment program, according to the data analysis in the current study, showed a substantial improvement in the mean values of VAS, PPT of the right trapezius, and ROM of Flexion, Extension, Left Side Bending, Right Rotation, and Left Rotation following treatment. The results were consistent with the research conducted by **Nagrale et al.** (2010), which found that INIT was intended to deactivate MTrPs and reduce muscular tone prior to extending the upper trapezius muscle.

To enhance ROM by equalizing truncated sarcomere [10]. NDI has a strong correlation with VAS and is susceptible to alteration [32]. According to one study, INIT to treat MTrPs has been shown to be more beneficial in treating pain, reducing stiffness, and improving functional ability in individuals with non-specific neck pain than METs alone [10]. Another study shown that neck pain caused by a trapezius trigger point can be treated just as successfully with INIT and laser therapy combined with stretching [11]. According to another study, INIT has shown to be more effective than INIT alone in lowering discomfort, reducing disability, and enhancing range of motion in active upper trapezius trigger points [1].

Neck pain is closely connected with neck muscular atrophy, as shown by **Häkkinen et al.** (2007) [45]. Changes in muscle architecture and the inhibiting effect of pain can both lead to a reduction in muscular strength [46]. Strengthening activities reduce pain as well because they promote blood flow [47]. The sensitivity of the muscle spindles, Golgi tendon organs, and joint proprioceptors may have increased as a result of isometric training [48].

The motor system’s inhibition is cited as the cause of pain relief since it may reduce muscular spasm, enhance neck function, and enable movement. [45,49]. Group Stretching and isometric strengthening exercises substantially improve function by lowering the neck disability index (NDI) score, which is linked to a decrease in discomfort and an increase in range of motion (ROM). [48,50–53].

Evidence of the effect of traditional physical therapy treatment

The VAS, PPT of the trapezius, and ROM of flexion, extension, left side bending, right rotation, and left rotation showed a substantial improvement after treatment, according to the isometric exercise data. Strengthening activities reduced discomfort as well because they improve blood flow [47]. Strengthening exercises also increase protein metabolism, which aids in the rehabilitation of a sore muscle and improves the muscle's ability to endure pressure and stress as it grows stronger [54]. The sensitivity of the muscle spindles, Golgi tendon organs, and joint proprioceptors may have increased as a result of isometric training [48]. Patients who report less discomfort may have less motor system inhibition, which could lessen muscular spasms, make it easier to move, and enhance neck function [49].

LIMITATIONS OF THE STUDY

Primarily, since the study only compared the effects of employing SWT against INIT in individuals with upper trapezius myofascial trigger points, more research is required to determine the effects over longer periods of time. Furthermore, because men and women were not compared in the study, more research is necessary to determine how gender differences affect upper trapezius myofascial trigger points.

5. CONCLUSION

Based on the current academic work's objectives and results, it can be said that, in cases with active myofascial trigger points in the upper trapezius muscle, SWT treatment was more effective than INIT after one month in terms of pain intensity level, pain pressure threshold, cervical range of motion, and neck functional disability level.

INTEREST CONFLICTS

No conflict of interest has been declared by the authors of this academic work.

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