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Original Article

Effectiveness of ischemic compression pressure versus spray and stretch technique in managing active myofascial trigger points of the trapezius muscle.

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Abstract

Background: Now, a days myofascial trigger points are tremendously occurring and become a stressful part of nearly any person at any time in a lifetime. This study compares the effects of ischemic compression pressure with spray and stretch technique to treat active myofascial trigger points of the trapezius muscle in patients with neck pain.

Methodology: A comparative interventional study was conducted at Dow University of Health Sciences from December 2016 and May 2017. Seventy patients (35 in each group) with active myofascial trigger points of trapezius were randomly assigned to group A (ischemic compression pressure) and group B (vapocoolant spray and stretch technique). Baseline and last session assessment of pain intensity, pain pressure tolerance, cervical range of motion and functional disability were measured through numerical pain-rating scale, algometer, goniometer and neck disability index, respectively.

Results: Both groups showed significant improvement in all dependent variables of study which were neck pain, cervical range of motion and pain pressure tolerance (p-value<0.05). Group A showed greater improvement in pain intensity (p-value 0.015), pressure pain threshold (p-value 0.000) and cervical range of motion flexion, left side flexion and right-side flexion (p-value 0.002, 0.000 & 0.004) than group B.

Conclusion: Both ischemic compression pressure & spray and stretch technique deactivated trigger points of upper fibers trapezius muscle in patients with neck pain, but the ischemic compression pressure was superior to the spray and stretch technique.

Keywords

Myofascial Pain Syndrome, Muscular Diseases, Myofascial Trigger Point Pain, Musculoskeletal Diseases, Superficial Back Muscles

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Introduction

Among musculoskeletal disorders, myofascial pain syndrome (MPS) is a significant health issue[1]. The most common MPS is characterized by myofascial trigger points (MTrPs). MTrPs are hypersensitive and hyperirritable nodules that originate within skeletal muscles. They can be palpated and are painful when compressed. Besides pain, they decrease mobility and affect the overall health[2,3]. MTrPs can be active or latent. An active myofascial trigger point (A-MTrP) is associated with pain during resting condition[3].

Currently, research revealed that 95% population had a prevalence of MTrPs. Myofascial trigger points mean age prevalence among adults is between 20 and 44 years[4]. It is estimated 54% for females and 45% for males. The role of estrogen has been recognized as a component of female prevalence[5]. The postural muscles are more prone to developing MTrPs in the neck. All spinal pain showed neck with highest prevalence rates for MTrPs[3]. Constant static and faulty postures like prolong use of computers or reading increase the development of MTrPs in the upper fibers of trapezius muscles[6]. Physical assessment is the only tool to diagnose the MTrPs. The Algometers have been used to determine the pressure threshold of the trigger point during assessment[7]. Manual techniques to deactivate MTrPs include transverse friction massage, strain-counter strain techniques, spray and stretch technique, post isometric relaxation, ischemic compression pressure, trigger point pressure release, stretching, etc. Physical therapy modalities include ultrasound therapy, hot packs, electrical muscle stimulator, dry needling and laser therapy[2,3].

Ischemic compression (IC) pressure is an effective and safe manual technique to deactivate TrPs[8]. In IC, constant pressure is applied to the TrPs with satisfactory force and for an extended period. When force is released, the skin becomes pale first and then shows reactive hyperemia[9]. The spray and stretch provide an instant reduction in pain and are applied for the deactivation of TrPs[10,11]. According to the researcher's knowledge, there is no study to date, which compared the effectiveness of these two physical therapy manual techniques for the deactivation of myofascial trigger points. The current study was conducted to compare the effectiveness of spray and stretch and ischemic compression pressure to treat active MTrPs of the upper fibers of the trapezius muscle.

Methodology

A comparative interventional study was conducted at the physical therapy department of the Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences (DUHS), from December 2016 to May 2017. This study was approved by the Institutional Review Board (IRB) of DUHS (Ref: IRB/DUHS/Approval/2016/229), and informed consent was obtained from all study participants.

A sample size of 30 for each group was calculated using PASS software RM-ANOVA (repeated measure analysis of variance) with 95% Confidence Interval and power of test kept 80% with group A pretest (4.65 ± 1.76) and post-test (4.96 ± 1.91) pain intolerance and group B pretest (3.88 ± 1.37) and post-test (4.36 ± 1.46) pain intolerance[12]. Considering a 15% drop rate, the investigator recruited 35 participants per group, with a total sample size of 70 participants having upper fibers trapezius trigger points. Patients with active MTrPs of upper fibers of the trapezius muscle, age between 25 to 40 years, working-class, who did not take any physical therapy treatment for TrPs in the last 30 days and not using any pain medication were enrolled in the study. However, specific neck pain due to cervical disc prolapses, cervical or thoracic spondylosis or its injury or fracture, spinal infection or cancer, whiplash injury, fibromyalgia and patients who took anti-inflammatory/analgesic medicine during the two weeks of enrolment in the research were excluded.

Participants were equally allocated to two groups by random allocation software (Group A & B). Both groups received six treatment sessions on alternate days for two weeks. The physiotherapist performed palpation to locate trigger points at the upper trapezius muscle and marked cross at the TrP with a permanent marker.

Both groups received a hot pack first in prone lying for 20 min. The group 'A' received ischemic compression pressure in the supine lying. The neck was held in lateral flexion (opposite side), then applied steadily increasing force to the TrP and waited for the patient's first noticeable ache. At that instant, the force was maintained until the release of patient pain until 50%. This procedure was maintained for 90 seconds[13,14].

The group 'B' received spray and stretch technique with bio-freeze (quick pain-relieving vapocoolant spray). The patient was positioned in the sitting then neck was held in lateral flexion (opposite side) then physiotherapist applied the vapocoolant spray from the acromion to the mastoid area. 2 or 3 sweeps of spray were applied, the spray was kept 15 cm away from the skin[11], and further stretch was given to muscle. For one session three stretch and spray technique was given. Then, an active stretch of the upper fibers of the trapezius was performed in both groups in the sitting. Participant held the bottom of the chair with the hand of the affected side; then, contra-lateral side bending of the neck was achieved to attain the upper trapezius stretch. This stretch was repeated three times per session, and the stretch was hold for 30 seconds.

Pre and post-treatment pain intensity, pain pressure threshold, neck range of motion (ROM) and disability were observed. The intensity of pain was assessed using a numerical pain-rating scale (NPRS). The sensitivity of NPRS is higher than other pain scales[15]. The patient was requested to tell one number from 0 to 10 in verbal or written form. Where zero expresses no pain and ten expresses the worst pain[16].

The pain pressure threshold was assessed through an algometer. An algometer was placed at the trigger point to estimate the pain pressure tolerance of the patients in the sitting position. The pressure gauge algometer is a threshold meter containing a latex disc with a one-centimetre square surface that is fixative to the pressure gauge. The algometer is measured using kilogram and pounds[17]. Cervical ROM was measured through a goniometer[18]. The neck pain disability index was used to assess neck disability. The Neck disability index comprised 10 constituents; 7 related to everyday actions, 2 related to pain, and one related to alertness. The score of 0 to 5 is used for each constituent result, and the total score is expressed in percentage (100% total highest score). Patients with high scores respond less disability (95% CI, 0.46–0.97; NDI ICC=0.92). The exclusive scoring structure with a score of fifty was used[19].

The recorded data were analyzed on a SPSS version 21.0. For all quantitative data, the statistical results were expressed as mean values along with standard deviation (mean ± SD). The categorical values were presented as frequency and percentage. Assumptions of normality were checked, so the parametric test, as normality assumptions were valid. An independent sample t-test was used to determine the difference between group A and group B. The difference within the groups was tested statistically by using paired sample t-test. A P-value less than 0.05 was considered statistically significant.

Results

This study consists of a total of 70 samples of patients, 35(50%) in each group. However, in group A, 27(77.1%) were female, and 8(22.9%) were male, whereas in group B, 21(60%) were female and 14(40%) were male. The mean age was 30.48 ± 5.16 years in group A and 30.02 ± 4.84 years in group 'B.' All outcome measures showed a significant difference with improvement from baseline to last session in both groups (p-value<0.05) except neck flexion in group B (p-value>0.05) (Table 1). All the outcomes showed no significant difference between the groups when measured before the treatment (p-value>0.05). However, those outcomes showed a significant difference between both groups (p-value<0.05) after the last session except for neck extension, left side rotation, right side rotation and disability (p-value>0.05) (Table 2).

Table 1: Mean change from baseline to the last session within the groups.

Outcomes	Group A			Group B		
	Baseline	Last session	p-value	Baseline	Last session	p-value
	Mean±SD			Mean±SD		
Pain intensity	5.28±2.09	1.51±1.06	0.000	5.14±1.81	2.42±1.88	0.000
Pain pressure tolerance	7.26±3.14	11.98±3.94	0.000	6.90±1.96	8.33±2.15	0.000
Neck flexion	37.42±9.95	45.42±10.31	0.000	37.14±9.49	37.80±9.65	0.427
Neck extension	35.00±5.14	36.71±3.82	0.001	36.00±7.45	37.57± 7.31	0.026
Neck left side flexion	21.22±4.95	36.77±4.30	0.000	21.51±4.24	31.51±5.22	0.000
Neck right side flexion	22.65±7.06	35.57±4.96	0.000	22.51±5.55	31.20±6.96	0.000
Neck left side rotation	39.71±6.52	44.34±1.49	0.000	42.57±4.08	44.42±2.64	0.000
Neck right-side rotation	41.00±4.82	43.71±2.52	0.000	41.00±5.25	42.85±3.27	0.005
Neck disability	21.54±12.48	15.31±10.69	0.000	17.02±10.61	12.22±9.45	0.000

Group A: ischemic compression pressure group, group B: spray and stretch group.
A significant difference from the baseline value in group A ($p<0.05$). A significant difference from baseline value in group B ($p<0.05$)

Table 2: Mean change in baseline and last session between the groups.

Outcomes	Baseline		p-value	Last session		p-value
	Group A	Group B		Group A	Group B	
	Mean±SD			Mean±SD		
Pain intensity	5.28±2.09	5.14±1.81	0.761	1.51±1.06	2.42±1.88	0.015
Pain pressure tolerance	7.26±3.14	6.90±1.96	0.577	11.98±3.94	8.33±2.15	0.000
Neck flexion	37.42±9.95	37.14±9.49	0.903	45.42±10.31	37.80±9.65	0.002
Neck extension	35.00±5.14	36.00±7.45	0.516	36.71±3.82	37.57±7.31	0.541
Neck left side flexion	21.22±4.95	21.51±4.24	0.796	36.77±4.30	31.51±5.22	0.000
Neck right side flexion	22.65±7.06	22.51±5.55	0.925	35.57±4.96	31.20±6.96	0.004
Neck left side rotation	39.71±6.52	42.57±4.08	0.032	44.34±1.49	44.42±2.64	0.868
Neck right-side rotation	41.00±4.82	41.00±5.25	1.000	43.71±2.52	42.85±3.27	0.224
Neck disability	21.54±12.48	17.02±10.61	0.108	15.31±10.69	12.22±9.45	0.205

Group A: ischemic compression pressure group, group B: spray and stretch group.
A significant difference from the baseline value in group A ($p<0.005$).
A significant difference from baseline value in group B ($p<0.05$)

Discussion

This study determined the effects of spray and stretch technique and ischemic compression pressure for trigger point deactivation of upper fibers trapezius muscle. The results showed that both interventions have positive effects in alleviating TrP pain intensity, pain pressure threshold, neck disability and improving range of motion (ROM) of the neck. However, the ischemic compression pressure was revealed to be more effective than the spray and stretch technique.

The mean NPRS was found significant within both groups. When comparison was made intergroup, a significant difference was found between the two groups in relieving pain. Ischemic compression pressure was proved superior in terms of alleviating pain. No evidence is present regarding the comparison between these two techniques. However, the present study's findings alleviating pain intensity, as measured by NPRS, with the application of ischemic compression pressure are consistent with the findings of research conducted

by Mott KK; indicating ischemic compression pressure is effective for pain relief in trigger points deactivation[9].

The pain pressure tolerance showed statistically significant improvement within both groups, and ischemic compression pressure showed more improvement in pain pressure tolerance. In a study, 30 subjects were randomly divided into one group treated with ischemic compression pressure with stretching and the second with active neck exercises with stretching. That study concluded ischemic compression pressure is effective for improving pain pressure tolerance in trapezius trigger points. The current study had a larger sample size than that study[8].

The degree of ROM was found statistically significant in both groups pre-and post-treatment. When comparison was made intergroup, a statistically significant difference was found in improving ROM. Ischemic compression pressure was superior to improve ROM. These findings are consistent with a study by Hou C-R and colleagues, indicating that ischemic compression pressure effectively improves neck ROM in trapezius trigger points[12].

The disability due to neck pain was found statistically significant in both groups pre-and post-treatment. The intergroup comparison showed statistically no significant difference between the two groups in improving functional disability. These results coincide with the result of Barbara et al. conducted a cohort study that concluded no significant[14].

The previous study of Mott (2015) also treated patients of MTrP using ischemic compression pressure and muscle stretching for 30 to 60 seconds. Pain intensity was assessed using NPRS and pressure pain threshold of TrPs by pressure algometer and concluded that IC pressure followed by stretching could be used as one of the early interventions for treating MTrPs[9]. That study supports the current study because the technique of ischemic compression pressure with the same protocols was used in this study with 30 seconds stretching of upper fibers trapezius muscle. However, the number of sessions given, i.e. 5 sittings (5 consecutive days), does not correspond to this study. In contrast, another Quasi-experimental study by Nambi and a co-worker compared the effects of ischemic compression pressure and muscle energy technique on 30 patients with upper trapezius TrPs. The study suggested that both treatment techniques reduce pain on VAS, but muscle energy technique is beneficial to improve the range of motion of neck checked with a goniometer[20]. Divergent to this study, pain pressure threshold was not assessed, and ischemic compression pressure was applied for 1 min.

Fareeda's study concluded that myofascial release is more effective than spray and stretch for reducing neck pain and cervical lateral flexion, which supported this study but contradicted was the number of sessions she only gives three sessions to the patients, which is a short-term treatment for deactivating trigger points[10].

The Kumar study concludes that the upper fibers of the trapezius muscle are essential in the mobility and stability of the neck. The conclusion suggested muscle energy technique is superior to ischemic compression and strain counter strain techniques, but they included only three outcome measures, pain intensity, neck lateral flexion ROM and neck disability index (NDI), in the management of trigger points related to upper trapezius[21].

Ferna'ndez de las Pen˜as have analyzed the effectiveness of the IC pressure technique, and transverse friction massage in the deactivation of TrPs used VAS and PPT as variables in their pilot study. IC pressure technique and transverse friction massage are comparably effective in reducing the tenderness of trigger points[22]. The above study supports this research because the technique of ischemic compression pressure with the same duration (90 seconds hold) was used in the present study with stretching of the trapezius. Spray and stretch are among the most commonly used methods for deactivating myofascial trigger points and can relieve pain immediately. Bahadir and

colleagues used a new vapocoolant spray with butane, isobutane, and propane mixture for myofascial trigger point's deactivation. Pain intensity on VAS and pain pressure tolerance using an algometer was assessed. They found traditional spray with stretch therapy as more effective than a spray–stretch alone reduces myofascial trigger points symptoms[11]. Zugasti and co-workers investigated the effect of spray and stretch versus control on reducing post-needling soreness of 1 latent myofascial trigger point at 70 participants. Their study showed that a one-time spray and stretch reduces post needling soreness produced by deep dry needling techniques in latent TrPs in the upper trapezius muscle[23].

The study limitation was it was a single-center study and mainly concerned with the short-term treatment effects with no long follow-up session. At the same time, the study's strengths were that the algometer was the benchmark, first time used in Pakistan for measuring pain pressure tolerance in this study. Multiple outcome measuring tools were used, NPRS for pain intensity, goniometer for neck ROM, algometer for pain pressure tolerance and neck disability index for a neck disability. The significance of the study was to address better treatment options and cost-effectiveness for the management of myofascial active trigger points of the trapezius muscle. In addition, this research outcome provided preferable treatment options for myofascial trigger points.

Conclusion

Both ischemic compression pressure and spray and stretch technique deactivated trigger points of upper fibers trapezius muscle. However, the ischemic compression pressure was superior to the spray and stretch technique in terms of alleviating pain intensity, improving cervical ROM and improving pain pressure tolerance for active myofascial trigger points of the trapezius muscle in patients with neck pain.

Conflicts of Interest

The authors have declared that no competing interests exist.

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