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COMPARATIVE EFFECT BETWEEN HOLD RELAX VERSUS ISCHEMIC COMPRESSION TECHNIQUES ON UPPER TRAPEZIUS MYOFACIAL TRIGGER POINT

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Dr. Vinod Babu. K, MPT[1], Dr. Sai Kumar. N, MPT[2], Akshata Akalwadi, MPT[3], Dr. Subodh Kumar Mahato, MPT[4]

Authors:
[2]Principal & Professor, Sanjay Gandhi Institute of Physiotherapy and Sanjay Gandhi Institute of Trauma and Orthopedics, Bangalore, India.
[3]Associate Professor, KTG College of Physiotherapy and KTG Multi Specialty Hospital, Bangalore, India.
[4]Physiotherapist, Bangalore, India.

Corresponding Author:
[1]Principal, Goutham College of Physiotherapy and Rehabilitation Centre, Bangalore, Karnataka, India.
Affiliated to Rajiv Gandhi University of Health Sciences, Karnataka.
E-mail: vinodbabupublications@gmail.com

Abstract

Background and Objective:*Myofascial trigger point (MTrP) in trapezius is common problem giving rise to characteristic-referred pain and motor dysfunction. Various techniques are widely used for treating the myofascial trigger point like Ischemic compression(IC), Hold relax (HR), positional release therapy, etc. The purpose of the study to compare the effect between Hold Relax versus Ischemic Compression techniques on pain, pressure pain threshold (PPT) and cervical lateral flexion range of motion (CROM) for subjects with upper trapezius myofascial trigger point.* ***Methods:*** *An experimental study design, 40 subjects with Chronic upper trapezius MTrP2 were randomized into two groups: HR group (n=20), and IC group (n=20). Subjects in HR group received Hold relax technique and Subjects in IC group received ischemic compression on Upper Trapezius TrP2, both the groups subjects received the technique for five times per session for six sessions per week for two weeks.* ***Results:*** *Analysis within the groups using paired't' test as a parametric and Wilcoxon signed rank test as a non-parametric test, there was a statistically significant improvements in means of VAS, PPT and cervical lateral flexion range of motion (ROM).* ***Conclusion:*** *The study concluded that the Hold relax technique and ischemic compression technique found statistically and clinically significant effect on improving pain, pressure pain threshold and cervical lateral flexion range of motion for subjects with Upper trapezius myofascial trigger point (TrP2). The ischemic compression techniques shown to have greater percentage of improvement in improving pain and pressure pain threshold than Hold relax technique.*

Key words: *Myofascial trigger point, Hold relax technique, ischemic compression technique, myofascial trigger point pressure release technique, pressure pain threshold, Trapezius, Pressure algometer.*

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INTRODUCTION

Myofascial Trigger points (MTrP) is defined as discrete, focal, hyperirritable spots located in a taut band of skeletal muscle. These spots are painful on compression and can produce referred pain, motor dysfunction, and autonomic phenomena.[1-3] MTrP are found in skeletal muscles and/or their fascia and the most commonly involved muscles are upper trapezius, levator scapulae, scalenes, and sternocleidomastoid.[4]

Pain in trapezius arises often in upper trapezius by two trigger points- TrP1 and TrP2 characteristically refer pain and tenderness along the postero-lateral aspect of the neck, behind the ear and to the temporal region.[4,5] On examination, it reveals that active rotation of head and neck toward the opposite side is painful at nearly full range and side bending to opposite side is moderately restricted. Clinically, it has very high recurrence with symptoms that affect daily activities that include neck stiffness and pain and frequent headache, dizziness, nausea, vomiting and insomnia.[5]

Hold Relax (HR) technique is a proprioceptive neuromuscular facilitation stretching technique frequently used in clinics which works theoretically on four physiological mechanisms: autogenic inhibition, reciprocal inhibition, stress relaxation, and the gate control theory. These mechanisms are reflexes that occur when the Golgi tendon organs (GTOs) detect harmful stimuli either in the tendons of the target muscle or in the antagonist muscle to the target muscle.[6] It uses the means of facilitation to correct muscle imbalances and restore the patient's ability to perform effective co-ordinated movement, increasing flexibility and improving pain.[7,8] It is considered an effective technique in respect to short-term gains in ROM. Generally, the immediate changes in ROM during stretching are caused by an abrupt increase in the rate of extension of the sarcomeres, a phenomenon referred to as sarcomere "give".[9] In addition, it has been considered that stretching techniques are likely to have an analgesic effect, which may be centrally or peripherally mediated, resulting in increased pain threshold and stretch tolerance.[10] Jung-Hong et al., examined the effects of treatment using PNF extension techniques on pain, pressure pain threshold, and neck and shoulder functions of the upper trapezius muscles myofascial pain syndrome (MPS) patients. In their study they found exercise programs that apply hold relax techniques is said to be effective at improving the pain and range of motion in MPS patients.[6]

Ischemic compression (IC) technique refers to trigger point pressure release which is the application of slowly increasing, non-painful pressure over a MTrP until a barrier of tissue resistance is encountered. Contact is then maintained until the tissue barrier releases, and pressure is increased to reach a new barrier to eliminate the trigger point tension and tenderness.[11,12] IC is firm sustained compression at a MTrP. Marie Alricsson et al., in their study concluded that ischemic compression is effective technique as compression lengthens the shortened sarcomere, the subsequent release of pressure corresponds to reactive hyperaemia which flushes away noxious substances and by products of cellular metabolism that foster muscle contraction.[13]

Research examining the effectiveness of both HR and IC technique is available,[6-13] but there are no studies have been found on comparative effectiveness between HR and IC on improving pain, pressure pain threshold and flexibility of upper trapezius muscle. Therefore, the present study with research question, whether there is any differences in effect of hold relax technique versus ischemic compression technique on pain, pressure pain threshold and of upper trapezius myofascial trigger points? Hence, the purposes of this study to compare the effects of hold relax technique versus ischemic compression technique on subjective pain, pressure pain threshold and trapezius flexibility for subjects with upper trapezius muscle MTrP. It was null hypothesized that there is a significant differences in effect of hold relax technique versus ischemic compression technique on

pain, pressure pain threshold and cervical lateral flexion range of motion (CROM) in upper trapezius myofascial trigger point

METHODOLOGY

An experimental study design with two groups- Hold relax group (HR group) and Ischemic compression group (IC group). As this study involved human subjects the ethical clearance approval was obtained from the Ethical Committee of KTG College of Physiotherapy and K.T.G. Hospital, Bangalore as per the ethical guidelines of Bio-medical research on human subjects. This study was registered under Rajiv Gandhi University of Health Sciences for subject for registration for dissertation with registration number 09_T031_47180. Subjects included in the study were with unilateral Chronic upper trapezius myofascial trigger point TrP2 located at the level of the C5 to C6 spinous processes approximately halfway between the acromion and the spinous processes[5], age group between 18 and 50 years, both male and female subjects, pain on VAS score in TrP2 more or equal to 6 during pressure palpation, pain on stretching of trapezius muscle, Travell and Simon's criteria- presence of a palpable taut band in the upper trapezius muscle, presence of a tender spot in the taut band, reproduction of subject's pain upon palpation without patient recognition of the symptom as familiar.[5] TrP2 pain without headache, pain on motion when head is fully rotated to opposite side (contracts muscle in shortened position). Subjects were excluded with contra-indications to myofascial release including vascular compromise, anticoagulant use and hemophilia, severe diabetes (with peripheral neuropathy), sensory deficit, infection (local and systemic),[14]contra-indications to stretching and massage, neck or shoulder surgery within a year, excessive subcutaneous fat layer thickness can limit the MTrP palpation.[15,16] Subjects were recruited and study was conducted at KTG Hospital, Bangalore. Subjects who meet inclusion criteria were recruited by Simple random sampling method using closed envelops, randomly allocated subjects into two groups. Subjects who meet inclusion criteria were informed about the study and a written informed consent was taken. Total 40 Subject (n=40), 20 in each group completed the studied. Total duration of intervention was for five times per session for six sessions per week for two weeks.

Procedure for intervention for Hold Relax Technique (HR) Group:

In this group subjects were treated with Hold relax technique (Figure-1).[6,15,16] The patient was in the sitting position and the therapist standing side of the patient. One hand of therapist stabilising shoulder of affected side and other hand on same side of the subject's head taking head to end range in opposite direction and applying stretch. Therapist stretch the upper trapezius until the stretching discomfort level reached the "4 out of 10" intensity by pulling the head in direction opposite to the affected side and rotating the subject's face toward the affected side. Stretch perception is the amount of force exerted in order to elicit the "4 out of 10" on the verbal numerical pain rating scale by the subject. The subject was asked to perform isometric contraction for 10 seconds followed by relaxation for 10 seconds. Then new position was held for further 10 second. This procedure was repeated for a total of five times for six sessions per weeks for two weeks.

Procedure for intervention for Ischemic compression Technique (IC) Group:[11,12,13]

In this group subjects were treated with Ischemic compression technique for Upper Trapezius TrP2 (Figure-2). The subject was placed prone with head relaxing over both hands fully on the couch to reduce tension in the upper trapezius muscle. That is, arm positioned in slight shoulder abduction with the elbow bent and hands resting under forehead. Therapist stands at the head side of the couch. First, TrP2 trigger point was located by palpating the muscle to feel for a taut band or a twitch response in the trapezius muscle. Then ischemic compression was performed by placing the thumb over nodule and gradually applying pressure till the

pain tolerance and maintained up to 90 seconds that was measured using stop watch. Subject was asked frequently to ensure that he/she was staying within the limits of his/her pain tolerance. Then pressure gradually released with few effleurage strokes to flush out the area. This was repeated for five times for six sessions per week for two weeks.

Figure-1: Hold relax technique.

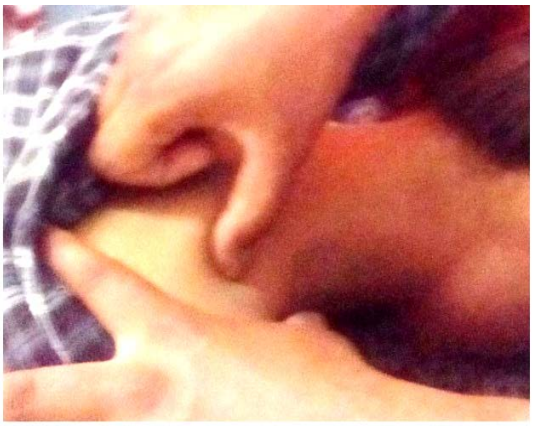


Figure-2: Ischemic Compression Technique.

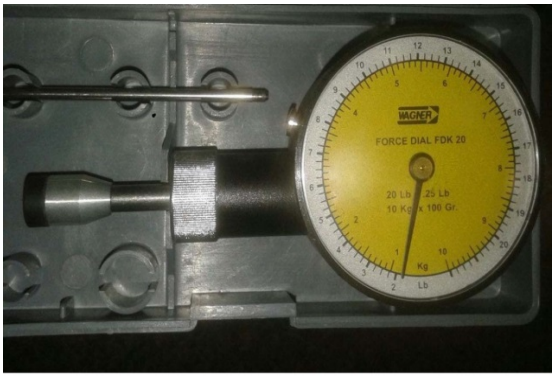


Figure-3: Pressure Algometer.

Figure-4: Starting position of PPT measurement.

Figure-5: Measurement of PPT after applying pressure.

Outcome Measurements:

All the subjects were assessed for outcome measurements where subjective pain was measured using visual analogue scale, pressure pain threshold using pressure algometer and flexibility of cervical lateral flexion active range of motion measured by Goniometer before and after 2 weeks of the intervention.

1. **Upper trapezius pain was measured by Visual Analogue Scale:**

Pain intensity was assessed using a visual analogue scale (VAS). Subjects placed a horizontal mark on a continuous 10 cm line to indicate pain intensity, ranging from no pain or discomfort tothe worst pain they could possibly feel. Thereliability and validity of VAS has been established previously.[17, 18]

2. **Pressure pain threshold (PPT) in Kg/cm² was measured using pressure algometer.**

The subject was side lying on the unaffected side. The PPT was measured over the relaxed trapezius muscles on TrP2. Three test trials, on a single point over rhomboid muscle were performed to familiarize the subject with the procedure. Then pressure was applied perpendicularly against the skin over the marked points in a fixed order over the trapezius muscle. The same sequence was repeated on the affected trapezius muscle. The subject was asked to say "yes" when he/she feel any discomfort or pain. Immediately the pressure is stopped if the subject feels pain and then pressure pain threshold was noted. Time gap of 5 to 10 minutes was given during the trails. The average score of all three trails was used to determine the effect. To measure PPT on the same after 2 weeks of intervention, the procedure was standardized by marking a permanent marker (skin marker) and marking was periodically examined and marked. Pressure algometer is useful tool in assessing the results and is a reliable tool for quantifying MTrP sensitivity.[19]

3. **Cervical lateral flexion active range of motion was measured using Goniometer**

Universal goniometer was used to measure cervical lateral flexion. Subject was asked to sit with thoracic and lumbar spine well supported by the back of the chair. Cervical spine was resting in 0^0 of flexion, extension, and rotation. Shoulder girdle was stabilized to prevent lateral flexion of thoracic and lumbar spine. The axis of goniometer placed over spinous process of C7, stable arm over spinous processes of thoracic vertebrae or perpendicular to ground and movable arm dorsal to midline of head where reference can be taken as occipital protuberance. Subject was asked to perform lateral flexion opposite to the involved side and reading was taken. This method of measuring range of motion has previously been found to be valid and reliable.[20]

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean $\pm$ SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Paired 't' test as a parametric and Wilcoxon signed rank test as a non-parametric test have been used to analysis the variables pre-intervention to post-intervention with calculation of percentage of change. Independent 't' test as a parametric and Mann Whitney U test as a non-parametric test have been used to compare the means of variables between groups with calculation of percentage of difference between the means. The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

The study was carried on total 40 subjects (Table-1) in Hold Relax Group there were 20 subjects with mean age 33.65 years and there were 14 males 6 females were included in the study. In Ischemic Compression Group there were 20 subjects with mean age 34.90 years and there were 6 males 14 females were included in the study. There is no significant difference in mean ages between the groups.

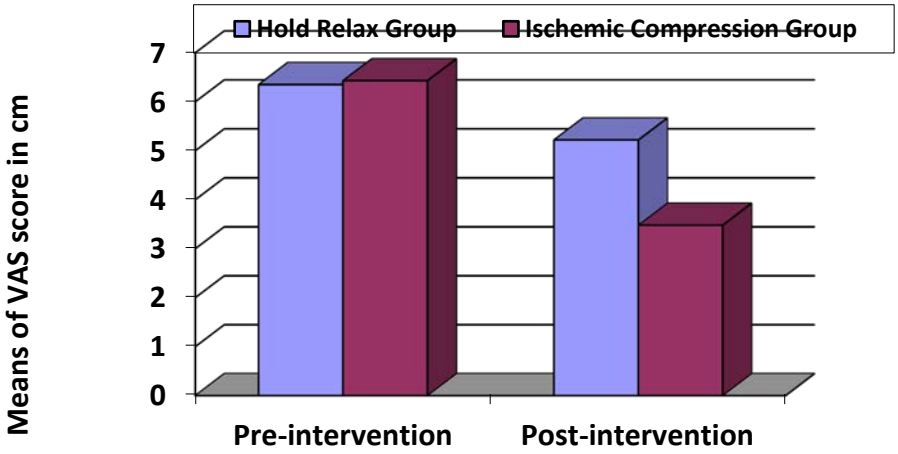
When means were analyzed within the groups (Table-2) shows that in Hold relax group and Ischemic Compression group

there is a statistically significant change in means of Visual analog score, cervical lateral flexion active ROM, and PPT measurements when means were analyzed from pre intervention to post intervention within the groups with p<0.000 with negative percentage of change showing that there is decreased in the post means. This shows clinical significant in improvement with large effect size in IC group than HR group.

When pre-intervention means compared (Table-3) between the groups there was no statistically significant difference in means of Visual analog score, cervical lateral flexion ROM, and PPT. When means of post intervention were compared between the groups there was a significant difference in means of VAS and PPT whereas there was no significant difference in means of CROM between the groups. There is negative percentage of changes seen that there is decreased in the post means. This shows clinical significant difference in means with medium effect size.

Basic Characteristics of the subjects d studied		Hold Relax Group (HR Group)	Ischemic Compression Group (IC Group)	Between the groups Significance
Number of subjects studied (n)		20	20	--
Age in years (Mean± SD)		33.65± 7.08 (25-48)	34.90± 11.14 (22-54)	p= 0.924 (NS)
Gender	Males	14m	14	
	Females	6	6	
Side	Right	11	14	--
	Left	9	6	

Table 1: Basic Characteristics of the subjects studied



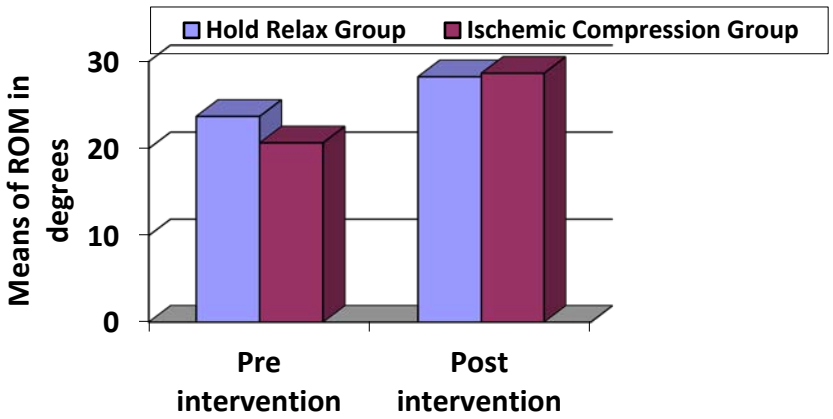
Graph 1: Comparison of pain between HR group and IC Group

The above graph shows that when pre-intervention means were compared between the groups there is no statistically significant difference in means of Visual analog score, when means of post intervention were compared between the groups there is a significant difference in means of VAS between the groups.

	Pre Intervention (Mean±SD) min-max	Post Intervention (Mean±SD) min-max	Percentage of change	Z value[b] Non parametric significance	t value a Parametric Significance P value	95%Confidence interval of the difference		Effect Size (r)
						Lower	Upper	
Hold Relax Group								
Visual analog scale score in cm	6.35± 1.18 (4.5- 8.1)	5.22±1.48 (2.5-7.3)	-17.79%	-3.443 P =0.001**	**4.728 P <0.000****	**0.629**	**1.630**	+0.38 Medium
AROM in degrees	23.70± 6.81 (10 – 33)	28.25± 5.03 (18 -35)	19.19%	-3.731 P <0.000**	**-7.317 P <0.000****	**- 5.852**	**- 3.248**	+0.33 Medium
PPT(In Kg/cm2)	2.74± 1.06 (0.8 – 5.1)	3.11± 1.13 (1.0 – 5.5)	13.50%	-3.420 P =0.001**	**-3.370 P =0.003****	**- 0.599**	**- 0.140**	+0.16 (Small)
Ischemic Compression Group								
Visual analog scale score in cm	6.43± 1.30 (4.3- 8.7)	3.48±1.89 (0.0-6.5)	-45.87%	-3.921 P <0.000**	**8.703 P <0.000****	**2.244**	**3.665**	+0.67 (Large)
ROM in degrees	20.65± 8.04 (8 – 34)	28.65± 5.44 (12 -35)	38.74%	-3.729 P <0.000**	**-5.368 P <0.000****	**- 11.11 9**	**- 4.881**	+0.50 (Large)
PPT(In Kg/cm2)	2.83± 1.37 (0.8 – 5.3)	4.56± 1.53 (2.1 – 7.5)	61.13%	-3.921 P <0.000**	**-6.181 P <0.000****	**- 2.309**	**- 1.140**	+0.51 (Large)

** Statistically Significant difference p<0.05; NS- Not significant; a. Pared t test. b. Wilcoxon Signed Ranks Test

Table 2: Analysis of pain, CAROM, PPT within Hold Relax Group and Ischemic Compression Group (Pre to post test analysis)



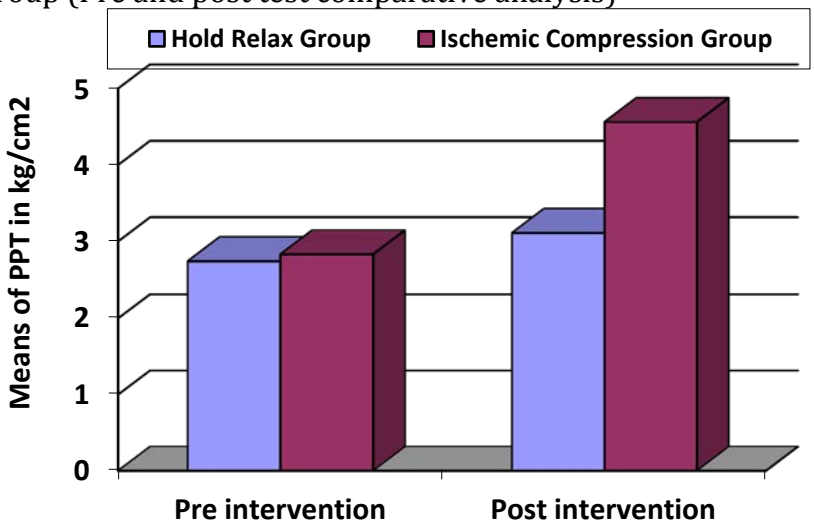
Graph 2: Comparison of cervical lateral flexion ROM between HR group and IC Group

The above graph shows that when pre-intervention means were compared between the groups there is no statistically significant difference in means of cervical lateral flexion ROM, when means of post intervention were compared between the groups there is no significant difference in means of ROM between the groups.

	Hold Relax Group Mean± SD min-max	Ischemic Compression Group Mean± SD min-max	Percent-age of change	Z value[b] Non parametric significance	t value [a] Parametric Significance P value	95%Confidence interval of the difference		Effect Size (r)
						Lower	Upper	
Pre intervention								
Visual analog scale score in cm	6.35± 1.18 (4.5- 8.1)	6.43± 1.30 (4.3- 8.7)	1.25%	-.149 P =0.882(NS)	-0.215 P =0 .831 (NS)	-0.8841	0.7141	+0.03 Small
ROM in degrees	23.70± 6.81 (10 – 33)	20.65± 8.04 (8 – 34)	-13.76%	-1.207 P =0.227(NS)	1.294 P =0 .204 (NS)	-1.723	7.823	+0.20 Small
PPT(Kg/cm2)	2.74± 1.06 (0.8 – 5.1)	2.83± 1.37 (0.8 – 5.3)	3.23%	-0.176 P =0.860 (NS)	-0.231 P =0 .818 (NS)	-0.8774	0.6974	+0.03 Small
Post intervention								
Visual analog scale score in cm	5.22±1.48 (2.5-7.3)	3.48±1.89 (0.0-6.5)	-40%	-2.873 P =0.004**	3.234 P =0.003**	0.6507	2.956	+0.45 Medium
ROM in degrees	28.25± 5.03 (18 -35)	28.65± 5.44 (12 -35)	1.40%	-0.409 P =0.682(NS)	-0.241 P =0 .811(NS)	-3.756	2.956	+0.03 Small
PPT(Kg/cm2)	3.11± 1.13 1.0 – 5.5	4.56± 1.53 (2.1 – 7.5)	37.80%	-3.033 P =0.002**	-3.384 P =0 .002**	-2.309	-0.580	+0.47 Medium

** Statistically Significant difference p<0.05; NS- Not significant; a. Pared t test. b. Wilcoxon Signed Ranks Test

Table 3: Comparison of pain, CROM, PPT between Hold Relax Group and Ischemic Compression Group (Pre and post test comparative analysis)



Graph-3: Comparison of PPT between HR group and IC Group

The above graph shows that when pre-intervention means were compared between the groups there is no statistically significant difference in means of PPT, when means of post intervention were compared between the groups there is a significant difference in means of PPT between the groups.

DISCUSSION

The present study found that the subjects who received HR and subjects who received IC found a statistically significant improvement in means of VAS, PPT and CROM within the groups. There was no significant difference in improvements between the groups. However, the subjects in HR group shown greater percentage of improvements than IC group.

In HR group, the improvements in pain, pressure pain threshold and cervical range of motion could be because of hold relax techniques that shown to have several effects. In MTrP there is formation of taut band with the subcutaneous tightness and shortening of sarcomeres. Application of this technique causes stretching effect by stimulating the proprioceptive myo-receptors of the muscle and tendon that improves the efficiency of the nerves that control muscles, normalize muscle tone, increases the blood circulation and tissue fluid. Trampas et al., in their study examined the effects of massage and hold relax relaxation stretching on the myofascial trigger point reported that there is a significant pain reduction in the group receiving hold relax technique.[6] Hold relax techniques shown to have effect due to neuro-physiological factors based on reciprocal inhibition and subsequent induction. Reciprocal inhibition describes the phenomenon that when a muscle group is activated, its antagonist is inhibited and thereby facilitating the elongation of this muscle-tendon unit.[9] Gonzalez-Rave et al.,[21] examined increases in the ranges of motion of the shoulder and the hip joints of 51 patients following the application of PNF techniques. They found greater increases in the ranges of motion of joints in the group who received PNF techniques, compared to other groups. Kofotolis and Kellis[22] examined changes in muscle endurance, flexibility, and functional ability to perform activities following stabilizing exercises and muscle power training using PNF techniques for 86 patients. They reported significant increases in all items in a group which performed an exercise program with PNF techniques.[22] Therefore in the present study found the significant improvement in outcome measures following application of HR techniques for Trapezius MTP pain. Kayla B. Hindle et al. reviewed possible mechanisms, proposed theories and physiological changes that occur due to proprioceptive neuromuscular facilitation techniques. Four theoretical mechanisms that occur in hold relax were identified: autogenic inhibition, reciprocal inhibition, stress relaxation, and the gate control theories which are the reasoning behind the increase in range of motion and function.[6]

In IC group, study found a statistically significant improvement in means of VAS, PPT and CROM when means were analysed within the groups. It can be speculated that reduction in pain and pressure pain threshold is because of ischemic compression technique that mechanically improve perfusion of the muscle spindles related to MTP, empty the analgesic substances from the peri-axial space via open sleeves of the spindle capsule and relieve neurogenic inflammation associated with myofascial pain.[23] Ischemic compression technique lengthens the shortened sarcomere, the subsequent release of pressure corresponds to reactive hyperaemia which flushes away noxious substances and by-products of cellular metabolism that enhance muscle contraction and relaxation thereby improving trapezius flexibility and increasing the cervical lateral flexion range of motion.[12,13] IC technique is also effective in decreasing

the stress on the nerve fibers, which end freely in the painful muscles spindles of the MTP improving CROM of the muscles. In a study conducted by Decicco and Fisher, it was suggested that compression using IC technique was effective in increasing the ranges of motion of joints.[24]

In present study, there was no statistically significant difference in means of VAS, PPT and CROMwhen pre-intervention means were compared between the groups. When means of post intervention were compared between the groups, there is a significant difference in means of VAS and PPT whereas no significant difference in means of ROM between the groups. Even though there is significant improvement in the both technique, the difference in greater percentage improvement in IC group could be due to added effect of reactive hyperemia in the MTrP region, counter-irritant effects, or a spinal reflex mechanism for the relief of muscles spasm. Simons et al., proposed that release of taut bands is essential to break the cycle that induces the ischemic contractions in the taut band that perpetuate myofascial pain syndrome. Hence in the present study, CROM in IC group found greater improvement could be due to breaking of cycle of ischemic contraction in the taut band.

However there is no statistically significance difference in improvement of CROM obtained between the groups, based on the finding in this study found that there is significant effects of Hold relax technique on VAS and PPT of trapezius MTP. Hence the present study rejects null hypothesis.

Limitations of the study

The study was carried for only two weeks. Therefore further recurrence of MTP not studied. Influence of severity of pain, duration of the symptoms and functional status of the patients were not considered that may influence the effect of techniques. Findings are based on VAS, ROM and Pressure pain threshold, functional improvement was not evaluated. Only intervention was compared between two groups but comparison of effects with control group was not known.

RECOMMENDATION FOR FUTURE RESEARCH

Further studies are needed to find the effect of these techniques on follow-up to find the recurrence of MTP. Further studies can be carried out to find effect of these techniques on other outcome measurements. Further study is needed to find the effect of these techniques on other muscle with MTP. Further study can be carried out to find the effect of these techniques in combination with other myofascial release techniques.

CONCLUSION

The present study concludes that the Hold relax techniques and ischemic compression techniques found statistically and clinically significant effect on improving pain, pressure pain threshold and cervical lateral flexion range of motion for subjects with trapezius myofascial trigger point (TrP2). It was found that there is no significant difference in improving cervical lateral flexion range of motion when compared between the techniques. However, ischemic compression techniques shown to have greater percentage of improvement in improving pain and pressure pain threshold than Hold relax techniques.

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