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Effect of kinesiotaping with conventional therapy on pain, cervical rom and function in myofascial pain syndrome of upper trapezius muscle

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ABSTRACT

Objective

To study the effect of Kinesiotaping (KT) with conventional therapy on Pain, Cervical range of motion (CROM), and function for myofascial pain syndrome of upper trapezius muscle.

Background

Neck pain is one of the frequent musculoskeletal related diseases in all age groups. Myofascial pain syndrome (MPS) is one common cause of neck pain. Effective techniques for short term management of this syndrome can help reduce the associated morbidity. Kinesiotaping is used as such an effective measure in addition to the conventional treatment.

Methods

40 patients with MPS were randomly divided in two groups – Control group (conventional treatment) and Experimental group (conventional + KT). The conventional group received moist heat, Myofascial release (MFR) and stretching exercises along with home programme of postural correction and Active cervical range of motion exercises. The experimental group received KT with conventional treatment. Treatment was given on the 1st, 4th and 7th day. Pre and post treatment values of CROM (tape measure), Numerical rating scale (NRS) for pain and Neck disability index (NDI) for function were recorded on every treatment session.

Results

Within the group analysis proved statistically significant improvement for both the groups for CROM, NDI and NRS (p value < 0.0001). Between the group comparison proved insignificant improvement for NDI & NRS and proved significant for cervical extension range of motion (p = 0.0293).

Conclusion

Effect of Kinesiotaping is equally effective as conventional treatment in relieving pain and improving cervical range of motion and function for Myofascial pain syndrome of the upper trapezius muscle.

Keywords: *Kinesiotape, Myofascial pain syndrome, trigger points, stretching*

INTRODUCTION

Myofascial pain syndrome is one of the most frequent causes of back pain and neck pain. [1, 2, 3] Myofascial pain syndrome (MPS) is commonly caused due to Trigger points (TP) which are relatively common in general medical practice. [4] A myofascial TP is defined as "a hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle's fascia, that is painful on compression and that can give rise to characteristic referred pain, tenderness, and autonomic phenomena". [5]

Pain due to myofascial trigger points can occur at various sites such as mandible, neck and shoulder girdle, low back, lower limbs.Neck pain can be because of TPs in the muscles of the neck and shoulder girdle i.e., sternocleidomastoid, scaleni, levator scapulae, trapezius, sub-occipital and posterior cervical muscles. [6] The upper trapezius is the muscle generally considered most likely to develop myofascial TPs. [5] Some of the causative factors include faulty postural habits, stiffness, ergonomic stressors, forward head posture and negligence towards the underlying pain. [7] Upper trapezius is one of the affected muscles. Triggers points present in the upper trapezius can further lead to chronic neck pain, migraines and shoulder pain. [8]

Patho-physiologically, in the post-membranous junction of the motor end plate, there is increased release of Acetylcholine (Ach) which can be due to certain changes for e.g., trauma to the cervical region, overuse of the muscle, prolonged faulty posture etc. This increased release causes sustained depolarization of the post junctional membrane. The sarcomere undergoes sustained shortening and contracture which is referred to as "contraction knot". This knot increases local energy consumption and reduction of circulation which induces local ischemia and hypoxia. Unrelieved tension of the sarcomere produces an enthesopathy at the myotendinous junction which are identified as "trigger point." This in turn causes increase in Ach which forms a positive feedback cycle. Treatment for myofascial pain syndrome should include breaking this feedback cycle. [2]

A number of invasive and non-invasive treatment techniques are available for treatment of the trigger points such as dry needling, local anaesthetic injections, Botulinum toxin, laser, stretch and spray, ultrasound, Transcutaneous Electrical Nerve Stimulation (TENS) Hot pack, Stretching and Myofascial release. [9]

Hot pack induces vasodilatation of the superficial tissue layer and helps in reducing the tissue density of the trigger point by fluid re-distribution. [10] Myofascial release is a soft tissue mobilization technique, defined as "the facilitation of mechanical, neural and psycho physiological adaptive potential as interfaced via the myofascial system. In this technique, there is a change in the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. This technique acts as a catalyst in the reduction of trapezius spasm. [11]

Simons suggested that the taut band is the necessary precursor to the development of Myofascial Trigger Points (MTPs) and that those who are more prone to develop taut bands are also more likely to develop MTPs. These latent trigger points are thought to become activated in response to the same conditions that cause trigger point formation, that is, muscle overload, prolonged muscle contraction, or nerve compression. These palpable taut bands represent histologically as sarcomere shortening. Therefore muscle-stretching techniques will be effective by equalizing sarcomere length throughout the affected muscle fibers and by breaking the cycle of events that could maintain sarcomere shortening. [2, 5]

Different types of taping techniques are also used in the non-invasive treatment of MPS such as sham taping, Kinesiotaping, cross-taping. [8] Kinesiotaping is widely used in sports medicine and musculoskeletal physiotherapy due to its quick and short term effects. Kinesiotape was developed by Kase (a Japanese chiropractor). This tape has adhesive properties and has the capacity of stretching upto 120%-130% of its original length. This property mimics the stretching quality of skin. [1, 10] It is found to be effective in pain relief, improving range of motion, acting as a aid in sports rehab.

AIMS AND OBJECTIVES

Aim

To study the effect of kinesiotaping with conventional therapy on Pain, Cervical range of

motion (CROM), and function for myofascial pain syndrome of upper trapezius muscle.

Objectives:

- To determine the effect of kinesiotaping with conventional therapy of myofascial pain syndrome of upper trapezius on **pain** using Numerical rating scale (NRS).
- To determine the effect of kinesiotaping with conventional therapy of myofascial pain syndrome of upper trapezius on **Cervical range of motion** (CROM) using measuring tape.
- To determine the effect of kinesiotaping with conventional therapy of myofascial pain syndrome of upper trapezius on **function** using Neck Disability Index. (NDI)

METHODOLOGY

After receiving the ethical clearance from the institutional committee from the college, the patients in inclusion criteria were included in the study with written consent and were randomly divided into control group (Group A) and experimental group (Group B) by simple random sampling.

Baseline values of Cervical Range of Motion (CROM) by measuring tape, Pain by Numerical rating scale (NRS) and function by Neck Disability Index (NDI) were obtained prior and post every treatment session on 1st, 4th and 7th day of both the groups.

Inclusion criteria

- Age – 18 to 50 years
- Unilateral involvement
- Diagnostic criteria [1]

1. A taut palpable band.
2. A palpable nodule within the palpable band.
3. Patient elicits a jump sign on palpation.
4. The zone of reference of the palpated trigger point is in accordance of that mentioned (described by the patient).
5. The zone of reference of the palpated trigger point is in accordance of that mentioned (achieved on manual compression).
6. Muscle displays decreased range of motion.
7. Pain with active or passive stretching of the muscle.

Exclusion criteria

History of trauma to cervical region, Degenerative conditions, Cervical Radiculopathy, Allergic to K-tape.

PROCEDURE

Pre treatment values of CROM, self rated NRS & NDI scale were obtained. The cervical ranges of motion were measured using a measuring tape. [14] The patient was in sitting position with thoracic and lumbar back supported against the back of the chair.

1. Flexion & Extension:- The distance between the lower tip of the chin and the sternal notch was measured at the end of the ROM. (Fig 1 and 2)
2. Lateral flexion:- Measured by the distance between the mastoid process and the lateral tip of the acromion process. (FIG 3.)
3. Rotation:- Grasp the patient; and passively rotate the head to the testing side and measure the range of motion. (FIG 4.)

Group A (Control group) received conventional treatment which consists of:-

Moist heat

The patient was in prone position. The hot pack was placed for 20 mins in the cervical para-spinal and upper thoracic region which involves the trigger point.

Myofascial release

- Gross MFR – The patient is in sitting position without using the backrest of the chair. The therapist anchors one hand near the occiput of the affected side and myofascial release was given with the ulnar border of the other hand in a outwards and downwards fashion. (Fig. 7)
- Focused release - the trigger point was treated with focused release using the lateral borders of both the thumbs.

Stretching

The patient is sitting on the chair without using the backrest. Then the therapist passively laterally flexes the neck to contra lateral side and rotates the head to the affected side. The therapist applies a stretch. This procedure was repeated thrice. For making the stretch more effective, the patient may

anchor the hand of the involved side to the base of the chair and apply a down wards force to the shoulder of the affected side. [5, 12] The patient were given home programme postural correction exercises and active cervical range of motion exercises which were demonstrated prior by the therapist.

Group B (Experimental group) The patients included were given Conventional treatment + K-tape (space orientation and muscle inhibition technique) of the affected upper trapezius muscle [1, 8] as shown in Fig. 9

Prior to application of the tape, the area of application was cleansed. Any allergic reaction to the tape was checked prior with application of a small piece of tape. The muscle inhibition was carried out with 15-25 % stretch in direction of insertion to origin of upper trapezius muscle. The space orientation was applied over the involved trigger point. The K-tape was applied at the end of the conventional treatment on 1st, 4th and the 7th day. Pre and post treatment values of CROM, NRS, and functional disability were recorded on every treatment session.

RESULT

Table 1: Demographic data:- Total population = 40

Groups	Female	Male	Total
Control	12	9	21
Experimental	14	5	19

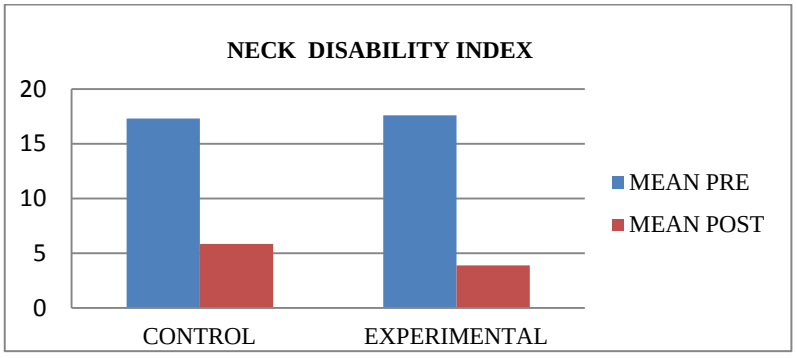
Within the group analysis for non-parametric data (NRS, NDI) was performed by Wilcoxon signed rank test; parametric data (ROM) was performed by paired t-test. Between the group analysis for non- parametric data was performed by Mann- Whitney- U test and parametric data was performed by unpaired t test.

NECK DISABILITY INDEX

Table 2:- Within the group analysis for NDI of both the groups by Wilcoxin signed rank test.

GROUPS	MEAN & SD		p VALUE
	PRE	POST	
CONTROL	17.31 ± 10.29	5.85 ± 5.71	0.0001**
EXPERIMENTAL	17.60 ± 8.42	3.89 ± 4.26	0.0001**

**extremely significant



Graph 1:- MEAN PRE and POST for NDI for both the groups

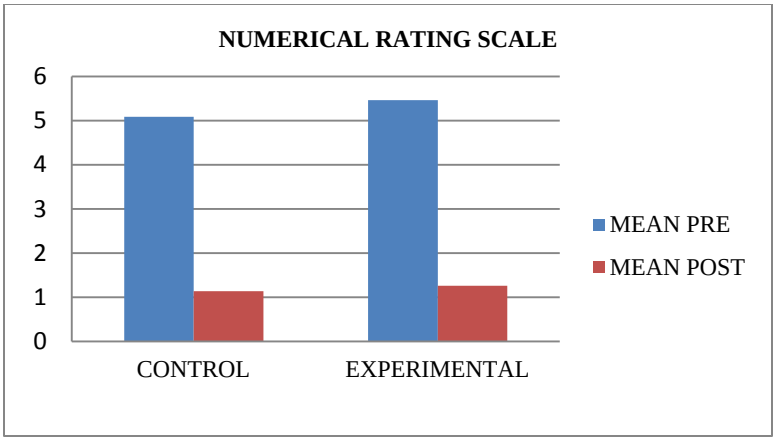
The above graph shows that there is improvement in Neck Disability Index for both the groups after the treatment.

NUMERICAL RATING SCALE

Table 3:- Within the group analysis for NRS of both the groups by Wilcoxin signed rank test.

GROUPS	MEAN & SD		p VALUE
	PRE	POST	
CONTROL	5.095 ± 1.22	1.14 ± 1.01	0.0001**
EXPERIMENTAL	5.47 ± 1.12	1.26 ± 1.36	0.0001**

**- extremely significant



Graph 2:- MEAN PRE and POST for NRS of both groups.

The above graph shows that there is improvement in cervical Numerical Rating Scale for both the groups after the treatment.

RANGE OF MOTION

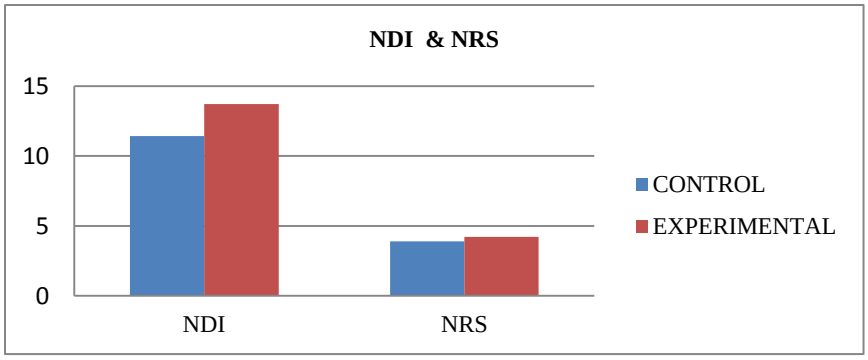
Table 4:- Within the group analysis of ROM performed by performed by paired t-test.

RANGE OF MOTION	CONTROL GROUP			EXPERIMENTAL GROUP		
	MEAN & SD		p VALUE	MEAN & SD		p VALUE
	PRE	POST		PRE	POST	
FLEXION	4.71 ± 0.73	3.83 ± 0.45	<0.0001**	4.63 ± 1.14	3.94 ± 0.64	<0.0001**
EXTENSION	19.02	19.42	0.0004**	18.89 ± 1.57	19.06 ± 1.42	0.0022*
RIGHT ROTATION	11.31 ± 1.13	9.37 ± 1.00	<0.0001**	11.39 ± 1.19	9.44 ± 1.07	<0.0001**
LEFT ROTATION	11.45 ± 1.14	9.95 ± 0.85	<0.0001**	10.94 ± 2.12	9.36 ± 1.28	<0.0001**
RIGHT LATERAL FLEXION	12.26 ± 1.53	10.54 ± 1.03	<0.0001**	12.05 ± 1.86	10.10 ± 1.03	<0.0001**
LEFT LATERAL FLEXION	12.59 ± 1.56	10.65 ± 0.85	<0.0001**	12.26 ± 2.03	10.07 ± 1.23	<0.0001**

**- extremely significant, * - very significant

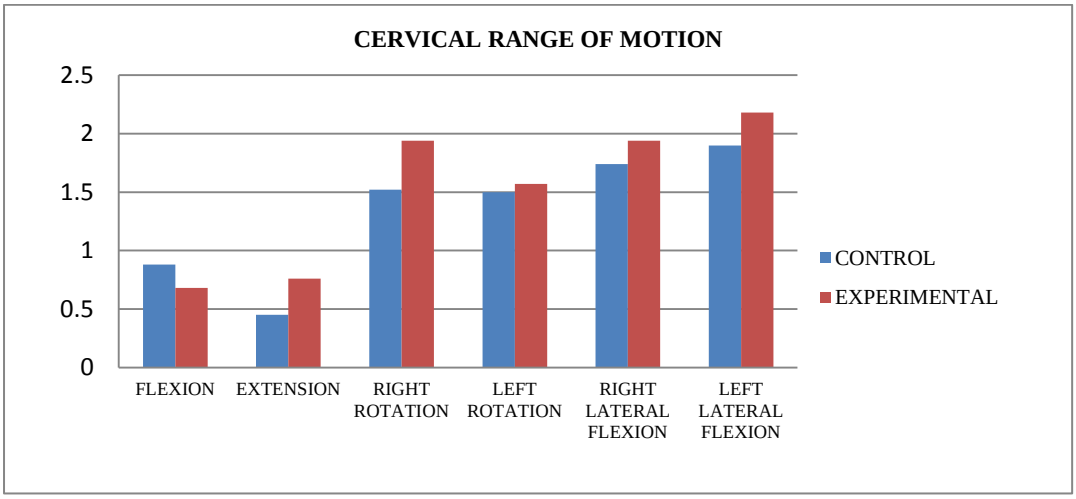
BETWEEN GROUP ANALYSIS

Between group analysis of NRS and NDI done by Mann-Whitney U test showed insignificant improvement in both the groups (p-value of NRS = 0.4214 and NDI= 0.2846)



Graph 7:- MEAN Difference for NRS and NDI of both the groups

The above graph shows that there is no differential treatment effects between the two treatments for NDI and NRS. Between the group analysis for range of motion was performed by unpaired t-test. The test showed significant improvement in cervical extension (p value= 0.0293) and insignificant improvement for cervical flexion, lateral flexion and rotation of both the groups.



Graph 8:- MEAN difference for ROM of both the groups.

The above graph shows that there is no differential treatment effects between the two treatments for all the cervical ranges except cervical extension.

DISCUSSION

Myofascial pain syndrome is the most commonly occurring musculoskeletal disorders. The main issue in the MPS treatment is to provide pain relief on trigger points, improving disability and increasing cervical motion. [15]

This study was performed to assess the effect of Kinesiotaping with conventional treatment on pain, cervical range of motion and function in myofascial pain syndrome of upper trapezius muscle.

40 subjects with myofascial trigger points in the upper trapezius muscle were randomly divided into control group and experimental group respectively. The outcome measures i.e., Neck disability index (NDI), Numerical rating scale (NRS) and the Cervical range of motion (CROM) were recorded prior and after every treatment session.

Conventional treatment included - hot pack which provided superficial heat to underlying tissue and through the underlying mechanism i.e., increasing small non-myelinated C-fiber activity that inhibits nociceptive signals within the spinal cord and brain stem. Heating decreases gamma-fiber activity in muscle, reducing the sensitivity of muscle spindle to stretch. It may also exert a psychosomatic effect. (16)

Hot pack reduces pain and minimizes muscle spasm as a consequence of increased activation of primary afferent fibers. [13]

Pain relief may result from relief of muscle spasm as a consequence of reduced activity of secondary (group II) afferent fibers and increased activity of primary (group Ia) afferent fibers, from a reduction of painful inflammatory reactions as a consequence of increased blood flow or from the counterirritant effects of a remote reflex phenomenon or an endorphine-related mechanism. [17]

In MPS, formation of trigger points causes unequal sacromere lengthening in the underlying muscle fibers. These are referred to as taut bands and are responsible for increased muscle tension. Normal muscle function depends on all sacromeres remaining the same length throughout the muscle fiber. Simons 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. [5] To break this cycle and achieve equal sarcomere lengthening, stretching exercises were performed.

Stretching exercises inactivates the stretched bands and trigger points, resulting in the shortened muscle to reach a near-normal length as well as the improvement in joint range of motion. (18)

Inhibition decreases the activity of the contractile component and results in an increased extensibility of the muscle and an increase in range of motion of the joint. [19] Increased range of motion immediately following passive stretching can be explained by the viscoelastic behaviour of muscle and short-term changes in muscle extensibility. [20]

Oliveira-Campelo and colleagues found that stretching produced short and medium term effects on CROM and pressure pain sensitivity in myofascial pain located in the upper trapezius muscle. [21]

AROM exercise cause gentle stretching which reduces subcutaneous tightness by movements of superficial tissues over deep tissues and thus aiding joint movement. [13]

MFR is an approach that focuses on freeing the restrictions in movements that originate from the soft tissues in our body. It is a form of soft tissue therapy that is intended to reduce pain and increase mobility in patients that are suffering from chronic pain conditions. Secondly by applying pressure and administering fascial release to areas of the body, this therapy aims to improve the health of fascia tissue. A slow gentle pressure allows the body's tissue to reorganize, release physical restrictions and release the body's unconscious holding and bracing patterns. As this technique produces heat and increases blood flow which releases tension from fibrous band of connective tissue it thus results in softening, elongating and realigning the fascia and removing restrictions or blockages in the fascia. [22]

Based on above mentioned mechanisms, the conventional group showed improved measures. Within the group analysis proved statistically significant improvement in **PAIN (**table 3, graph 2**)** for both the groups (p value= 0.0001). Between the group analysis for NRS proved insignificant improvement in both the groups (p value= 0.4214). (Graph 7).

The application of kinesiotape helps in interfering nociceptive stimuli reaching the central nervous system and inhibit the pain by the pain gate mechanism. KT increases blood and lymphatic fluid circulation under the taped area in a consequence of a lifting effect, which creates a wider space between the skin and the muscle. Stimulating the gate control mechanism results decrease in pain through the increase in afferent feedback found in the skin [8, 15] This mechanism explains the reduction in pain seen in the experimental group post the treatment.

Within the group comparison performed by paired t-test (table 4, graph 3-6) of both the groups for **ROM** proved extremely significant improvement for all the cervical ranges. (p value= 0.0001). Between the group comparison performed by unpaired t-test proved significance to cervical extension range of motion (p value=0.0293) and proved insignificant for all the other ranges. (Graph 8).

The proposed mechanism for effect on ROM is that Kinesiotape activates the Golgi Tendon Organ (GTO) in the neuromuscular junction of the upper trapezius and causes subsequent muscle relaxation. [1] Saime Aye et al. & Mark Thelen observed the effect of KT on ROM. [15, 23] The mechanism for increase in ROM is by the gate control theory i.e., an increase in afferent stimulus to large-diameter nerve fibers can serve to mitigate the input received from the small-diameter nerve fibers conducting nociception. The application of tape on skin provides propioceptive stimulus increased the motor units recruited to perform the range of motion thus improving the range.

As shown in graph 1, significant improvement is observed for **FUNCTION** of both the groups (p value=0.0001) (graph 1). Between the group comparison proved statistically insignificant (p value = 0.2846) (graph 7). Changes in the baseline values of NDI are seen in both the groups. As seen above, improvements in pain and CROM are observed which help in overcoming the restriction of the activities thus improving the functional ability in both the groups.

Comparing the analysis between both the groups in this study we found that both the groups show equal statistical improvement in both the groups hence we accept the null hypothesis that conventional treatment is equally effective as Kinesiotaping combined with conventional treatment.

CONCLUSION

Within the group analysis proved significant improvement in pain, function and cervical range of motion. Between the group analysis of both the groups proved insignificant improvement for pain, function and cervical range of motion. Therefore the null hypothesis (H0) is accepted i.e., Effect of Kinesiotaping is equally effective as conventional treatment in myofascial pain syndrome of upper trapezius muscle.

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