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AN ELECTROMYOGRAPHIC ANALYSIS TO COMPARE THE EFFECT OF MYOFASCIAL RELEASE AND POSITIONAL RELEASE TECHNIQUE ON TRIGGER POINT IN UPPER TRAPEZIUS MUSCLE

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ABSTRACT

Objective: An EMG analysis to compare the effect of PRT and MFR among the subjects with trigger point on upper trapezius.

Background: Neck Pain is the 4th major epidemic that is responsible for the disability. MPS is a painful and prevalent musculoskeletal problem that originates as hyperirritable spot with a taut band in skeletal muscle. MPS is the regional muscle pain followed by trigger points. MTrPs are caused by prolonged poor posture, overuse, sustained contraction of the muscle, vitamin deficiencies, etc. During palpation, the pain from the MTrPs spreads to distant muscles. Hence, the occurrence of referred tenderness depends on the irritability of the MTrP on compression.

Study Design: Quasi-Experimental Design Comparative in nature

Methodology: After taking written informed consent, 45 subjects including both genders with age group 20-40 years, who met the inclusion and exclusion criteria were assessed for pain, ROM, PPT, functional disability and muscle activity. They were divided into 3 groups with 15 subjects in each group, Group-A was given HP,TENS and US, Group-B and C was given MFR and , PRT along with control group intervention, respectively for 5 days a week for 2 weeks.

Results: When the results were analysed within the group, there was significant improvement seen in all parameters for three groups. The intergroup analysis showed that there was non-significant difference in all parameters.

Conclusion: It was concluded that both of the manual therapies and conventional treatment were equally effective.

Keywords: MPS, MTrP, Neck Pain, MFR, PRT

1. INTRODUCTION

Musculoskeletal pain is most prevalent problem in middle aged adults producing the tremendous impact on the studying and working population. It is highest amongst people performing low-level static exertions, such as computer users.[20] About 23 million people or 10% of US population have one or more chronic disorders of the musculoskeletal disorders.[11]

Musculoskeletal impairments are divided into 2 clinical based categories, i.e., articular and non-articular. The articular group comprises of the joint diseases that involves inflammation or injuries caused due to trauma or degenerative processes, for eg- rheumatoid arthritis or shoulder instability. The non-articular group contains the condition's that primarily affects the peri-articular structures such as muscles, ligaments and tendons, for eg- fibromyalgia, myofascial pain syndrome & tendonitis.[16,24]

MPS is one of the known musculoskeletal disorder, that occurs because of repetitive tasks with prolonged static loads.[11] It is the painful condition that is commonly seen in the neck muscles, particularly in upper trapezius with the prevalence rate of 34.7%.[29]

MTrPs are considered as a major source of pain in 30% of the population along with musculoskeletal dysfunction.[5] The prevalence rate of the trigger points is seen in 54% of women and 45% of men.[16] The prevalence rate of TrPs is higher in high-income countries as well as in the urban areas.[18] Trigger points are known to be the most common cause of pain in the musculoskeletal system.[26] Furthermore, it has been known to be associated with prolonged muscle imbalance, sustained and repetitive micro trauma, overuse of the unconditioned muscle, prolonged stress on the musculoskeletal structures and poor posture, sleep disorders, and

nutritional deficiencies.[25] It has been observed that TrPs are recognized in 35% of the splenius capitis muscle and 33% in upper trapezius muscles among all the neck muscles.[29] One of the author found that the 93.75% of the subjects has the most prevalent active MTrPs in the upper trapezius muscle. The active MTrPs has the prevalence of 82.1% on the right side and 79% on the left side in the upper trapezius muscle.[34] The rate of prevalence is 82.14%, 77.68% and 62.5% in the active MTrPs in the levator scapulae, multifidi, and splenius cervicis muscles respectively.[25] In medical practice, due to poor recognition and management, 10%-18% of TrPs cases are seen which leads to myofascial pain with the lifetime prevalence of 30% to 50%.[8]

The basic management of the MPS is to resolve the spasm, to reduce the pain and to inactivate the TrPs. TrPs are the muscle knots, that are caused when the basic injury is not treated and the spasm keeps the muscle continuously "on". The injured or overloaded muscle leads to the involuntary shortening, loss of the oxygen and the nutrient supply because there is increase in the demand of the local tissues.[13,14,12,22]

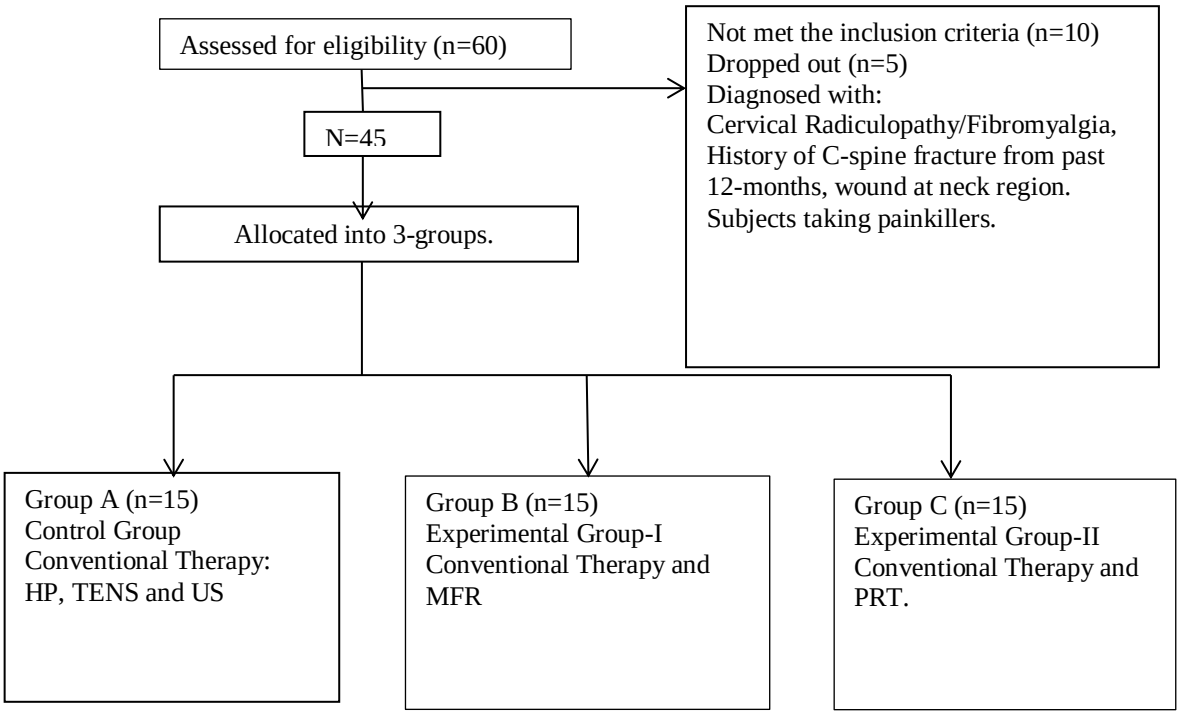
MTrPs in the trapezius muscle are most commonly found at the midpoint of the upper border of the muscle. When the trapezius muscle gets shortened, they restrict the ROM in head, neck and shoulder and often becomes painful. The pain is present even during the rest and gets aggravated by the activity. The pain can be usually refers to the other areas from the site of primary inflammation.[1] Trigger point in upper trapezius are present in two places: TrP1 found in the middle zone of the anterior borders of the upper trapezius and mostly involves the vertical fibers that attach to the clavicle. It refers a pain upward along the posterolateral aspect of the neck to the mastoid process, when becomes intense, the pain extends to the area of head. TrP2 is present caudally and slightly lateral to TrP1. TrP2 gives the referral pain behind the ear, slightly posterior to the reference zone of TrP1.[32]

In order to manage the patients with MTrPs medications such as NSAIDs, analgesics and antidepressants are advised.
The physiotherapy treatment includes the patient education, electrotherapeutic modalities, heat/ ice therapy, acupuncture, dry needling, stretching, LASER, and therapeutic exercises. For the deactivation of the TrPs and to reduce spasm Manual approaches like MET, PRT, DTFM, PNF, Ischemic Compression, MFR has been recommended, involved in lengthening of shortened/contracted muscle, improves the range of motion of stiff joint, and enhances the relaxation of muscles.

Huge body of the literature showed the management strategies for relieving the TrPs. Still, there is a gap regarding the effective management of TrPs with the help of short term manual techniques like PRT and MFR. So, the present study was designed to compare these treatment strategies using a sophisticated tool (EMG) among the population suffering from upper trapezius trigger point.

2. METHODS:

A comparative and quasi experimental study of 45 subjects, between the 20-40 years of age, were allocated from the OPD of the Institute and affiliated hospitals. The study received the clearance from the Institutional Ethics Committee and authority. The subjects were selected if they present with the trigger point on the upper trapezius muscle, including a positive jump sign and restricted range of motion. After obtaining a consent, the subjects were recruited on the basis of the inclusion and exclusion criteria. They were further divided equally into three groups.
Throughout the study, the subject's privacy was maintained.



2.1 Protocol:

In the control group, the hot pack, burst TENS and US were given. The HP consisted of application of hot pack for 20 minutes over the area of MTrP.[11] Later, the burst-TENS was applied in supine lying position, with the pulse frequency of 100-Hz and pulse width-200µs and frequency 2-Hz was applied for 10 minutes at the comfortable intensity. Two electrodes were placed: Active electrode-over MTrP and the ground electrode- over deltoid insertion.[4] For the application of Ultrasound, the subject is positioned on the stool in erect posture, whereas, the therapist stands behind the patient. The US head was applied over area of MTrP of upper trapezius muscle for 7 min on continous mode with intensity of 1.5 W/cm^2 and frequency of 1MHz[4] .[11]

In the MFR group, along with conventional therapy, the direct method of MFR comprised of pressure application with the help of soft fists/elbows. A line of tension was taken into the mid-belly of the trapezius further taking at the acromial processes. The process is repeated 2-3 times.[15] (Fig.1)

Figure No. 1 MFR Application

In the PRT group, along with conventional therapy, the subject is placed in supine lying position, while, the therapist stands facing towards the head facing towards the affected side. The subject's head was laterally flexed towards the tender point side. The therapist grasps the patients forearm and abducts the shoulder to approximately 90º and adds slight flexion or extension of the fine tune.[17] (Fig. 2)

Figure No.2 PRT Application

EMG:

The subject was positioned in high sitting. The therapist stands next to the patient's chair. The two electrodes were placed between cervical spine at C7 and acromion. Electrodes were placed over muscle belly.[1]

For the upper trapezius muscle, 3 muscle tests were performed to produce maximum EMG activity. Two of the tests were implemented as, the resistance was given by the therapist while patient performs shoulder shrugging or shoulder abduction to 90° with head and neck rotated to opposite side and side bent to same side in both of the cases. Third muscle test was performed with flexed shoulder to 125°. [34] (Fig. 3-6)

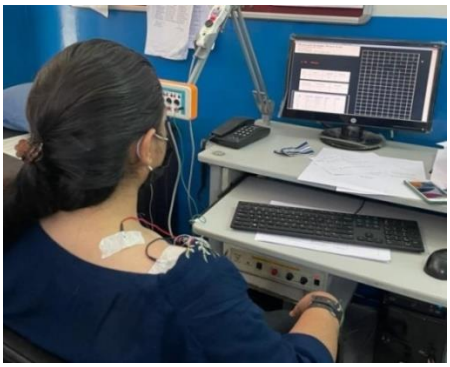


Figure No.3 Electrode Placement

Figure No.4 Resisted Shrugging

Figure No.5 Resisted Flexion

Figure No.6 Resisted Abduction

Total 10 sessions were given. ROM, PPT, NPRS, NDI, and Muscle Activity of all the subjects were measured on 1st day, 5th day and 10th day of interventions.

Data Analysis: Data was analysed by using the SPSS software.

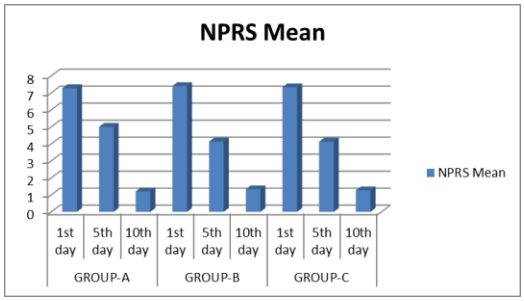
3. RESULT:

To know the effects of two different treatment approaches, the pre- post-intervention outcomes measures were compared between the control group and the two experimental groups. Total 45 subjects were enrolled into the study, out of them 17(37.77%) were males and 28(62.22%) were females. Chi-square test was done to compare the mean of gender in between the groups. Within the group analysis was done with the help of repeated measures shown that there was statistically highly significant difference found in the means of NPRS, PPT, NDI, cervical ROM and EMG activity (table no .1& graph no.1-14) and between the group analysis was done using one-way ANOVA resulted in non-significant differences for all the outcomes measures where as in comparison to control group both the experimental groups showed significant differences for NPRS, ROM, NDI and PPT (table no .1& graph no.1-14). No significant differences were observed for EMG activity when compared in between control and experimental groups.

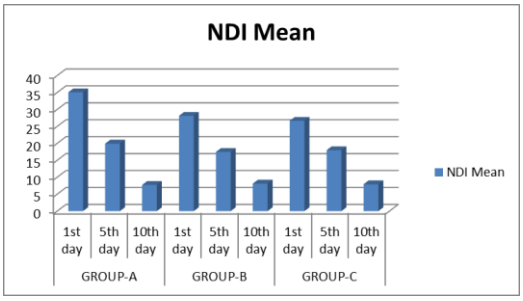
PARAMETERS		GROUP-A			GROUP-B			GROUP-C			BETWEEN GROUP		
		1st day	5th day	10th day	1st day	5th day	10th day	1st day	5th day	10th day	1st	5th	10th
NPRS	Mean	7.27	5.00	1.20	7.40	4.13	1.33	7.33	4.13	1.27			
	S.D.	±1.486	±0.926	±1.082	±1.765	±1.356	±0.900	±1.543	±1.246	±0.887			
	F-value	118.088			303.561			313.086			0.26	2.652	0.072
	P-value	0.000			0.000			0.000			0.974	0.082	0.930
NDI	Mean	35.07	19.93	7.73	28.13	17.47	8.13	26.67	18.00	7.93			
	S.D.	±6.681	±6.39	±4.114	±6.413	±6.498	±4.912	±7.335	6.470	5.650			
	F-value	167.138			221.121			150.232			6.490	0.596	0.025
	P-value	0.000			0.000			0.000			0.300	0.556	0.976
PPT	Mean	0.540	1.027	1.633	0.687	1.220	1.813	0.747	1.253	1.747			
	S.D.	±0.2849	±0.3432	±0.3658	±0.3662	±0.4212	±0.4704	±0.3502	±0.3461	±0.3563			
	F-value	137.176			101.273			350.540			1.505	1.624	0.773
	P-value	0.000			0.000			0.000			0.234	0.209	0.468
AROM Rt. Side Bending	Mean	31.47	33.20	35.80	25.53	28.27	30.73	32.07	29.13	34.60			
	S.D.	±5.780	±5.747	±5.772	±6.081	±6.053	±6.216	±6.076	±5.792	±6.116			
	F-value	50.853			127.113			167.206			3.868	2.819	2.885
	P-value	0.000			0.000			0.000			0.290	0.071	0.067
PROM Rt. Side Bending	Mean	26.87	34.00	39.93	27.20	29.47	32.00	30.27	33.20	36.00			
	S.D.	±4.984	±4.645	±4.096	±5.833	±5.963	±6.047	±5.934	±6.120	±6.313			
	F-value	94.687			168.693			342.167			1.680	2.786	7.597
	P-value	0.000			0.000			0.000			0.199	0.073	0.200
AROM Lt. Side Bending	Mean	32.00	34.47	37.93	25.93	28.07	30.87	29.80	32.00	34.73			
	S.D.	±4.706	5.705	±4.847	±5.663	±5.378	±5.370	±7.571	±7.455	±7.206			
	F-value	97.853			97.551			79.947			3.806	4.006	5.405
	P-value	0.000			0.000			0.000			0.061	0.066	0.080
PROM Lt. Side Bending	Mean	33.20	36.207	39.33	27.13	29.73	32.07	30.47	33.53	35.93			
	S.D.	±4.784	±5.427	±4.967	±5.768	±5.483	±5.522	±7.347	±7.230	±6.954			
	F-value	92.977			109.836			114.995			3.772	4.251	5.747
	P-value	0.000			0.000			0.000			0.30	0.21	0
AROM Rt. Rotation	Mean	59.07	63.73	66.33	52.00	56.73	62.00	55.93	58.20	60.93			
	S.D.	±12.709	±13.366	±14.09	±11.619	±11.380	±11.477	±15.215	±15.101	±15.318			
	F-value	32.726			118.593			79.947			1.256	1.850	2.352
	P-value	0.000			0.000			0.000			0.295	0.170	0.108
PROM Rt. Rotation	Mean	59.87	65.07	68.93	53.53	58.87	64.33	57.00	59.13	60.93			
	S.D.	±12.529	±13.408	±13.709	±11.407	±11.325	±11.739	±15.085	±14.899	±15.318			
	F-value	36.991			157.382			108.396			0.879	1.043	0.996
	P-value	0.000			0.000			0.000			0.423	0.361	0.378
AROM Lt. Rotation	Mean	59.07	62.87	66.73	50.33	52.47	55.27	56.20	58.73	60.87			
	S.D.	±12.36	±12.63	±13.53	±11.387	±11.044	±11.477	±16.045	±15.836	±15.707			
	F-value	37.674			105.562			91.936			1.651	2.318	2.717
	P-value	0.000			0.000			0.000			1.651	0.111	0.078
PROM Lt. Rotation	Mean	59.13	63.73	67.60	51.53	54.07	56.73	57.27	59.73	62.13			
	S.D.	±13.163	±13.997	±14.14	±11.363	±11.022	±10.813	±16.109	±16.015	±15.743			
	F-value	51.793			143.265			165.556			1.256	1.850	2.352
	P-value	0.000			0.000			0.000			0.352	0.170	0.108

Table-1 Depicting the Mean, S.D., F-value and p-value amongst various parameters.

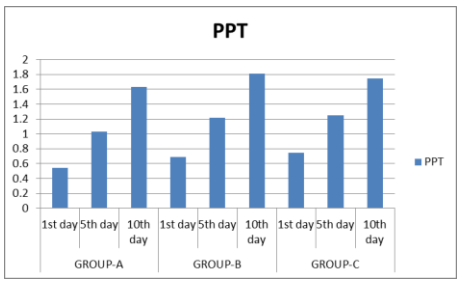
PARAMETERS		GROUP-A			GROUP-B			GROUP-C			BETWEEN GROUP		
		1st day	5th day	10th day	1st day	5th day	10th day	1st day	5th day	10th day			
EMG Abduction	Mean	570.187	610.607	753.960	601.440	685.767	766.180	670.553	669.44	752.167			
	S.D.	±79.9465	±95.9832	±73.9104	±124.3765	±121.5878	±130.7945	±79.7624	±84.83	±82.4			
	F-value	32.357			25.593			49.683			0.444	0.261	2.529
	P-value	0.000			0.000			0.000			0.644	0.771	0.092
Shrugging	Mean	620.007	670.813	737.040	570.189	610.607	753.960	601.440	685.767	766.180			
	S.D.	±97.3689	±80.6865	±92.9414	±79.9465	±95.9832	±73.9104	±124.3765	±121.5878	±130.7945			
	F-value	37.457			37.457			32.327			0.910	0.335	0.309
	P-value	0.000			0.000			0.000			0.410	0.109	0.736
Flexion	Mean	595.693	654.380	690.933	555.127	639.727	700.700	574.34	625.607	691.513			
	S.D.	±75.7113	±65.670	±70.28	±93.665	±804.254	±60.5223	±121.2675	±131.7223	±145.2977			
	F-value	24.763			28.819			18.286			24.763	28.819	18.286
	P-value	0.000			0.000			0.000			0.000	0.000	0.000



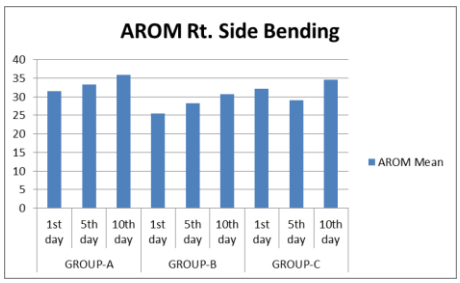
Graph.1 Comparison of mean scores for NPRS



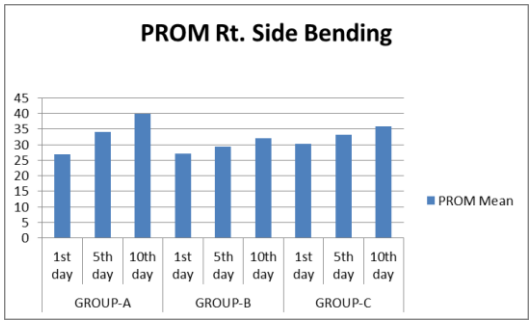
Graph.2 Comparison of mean scores for NDI



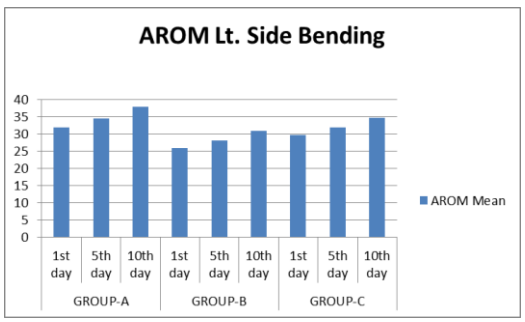
Graph.3Comparison of mean scores for PPT



Graph.4Comparison of mean scores for AROM(Rt. SB)

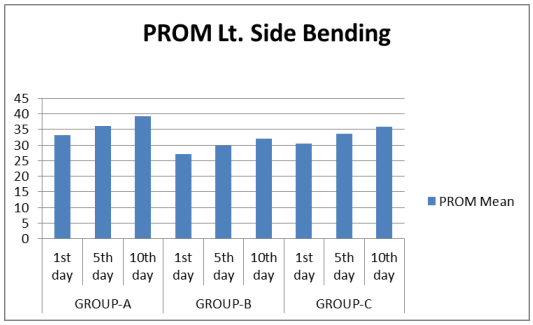


Graph.5 Comparison of mean scores for PROM



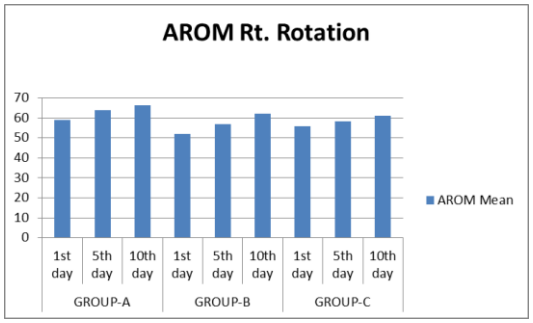
Graph.6 Comparison of mean scores for AROM

(Rt. Side Bending)

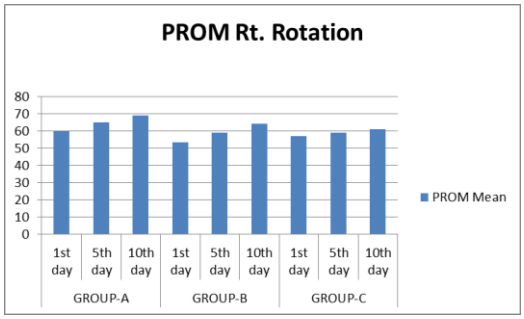


Graph.7 Comparison of mean scores for PROM (Lt. Side Bending)

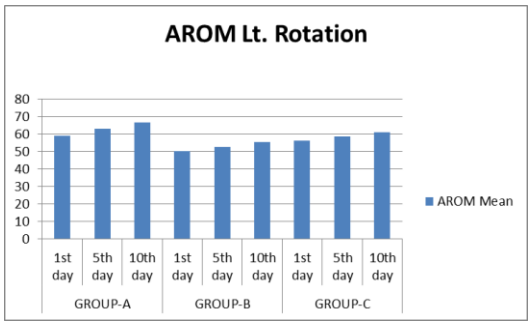
(Lt. Side Bending)



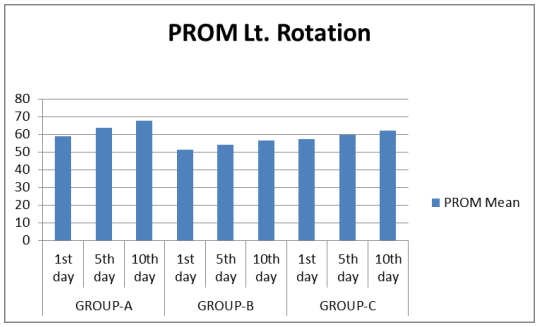
Graph.8 Comparison of mean scores for AROM (Rt. Rotation)



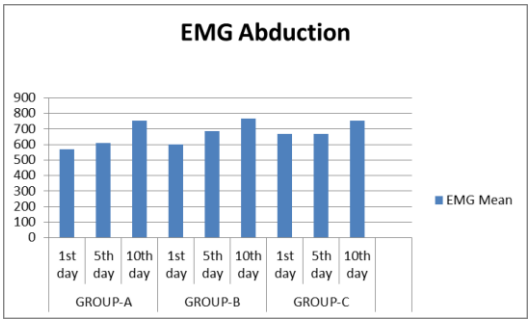
Graph.9 Comparison of mean scores for PROM (Rt. Rotation)



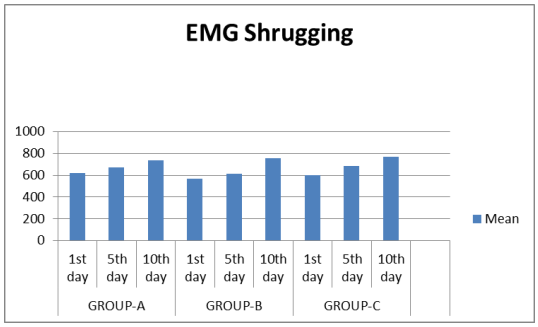
Graph.10 Comparison of mean scores for AROM (Lt. rotation)



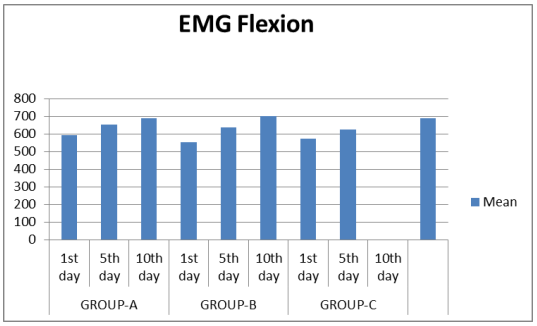
Graph.11 Comparison of mean scores for PROM (Lt. rotation)



Graph.12 Comparison of mean scores for EMG (Abduction)



Graph.13 Comparison of mean scores for EMG (shrugging)



Graph.14 Comparison of mean scores for EMG (flexion)

4. DISCUSSION:

The purpose of the current study was to perform an EMG anaylsis to compare the effect of MFR and PRT in the patients suffering for trigger points on upper trapezius muscle.

Our evaluation exposes a widespread use of within-group analyses, claiming statistically non-significant results to be effective. Whereas, when the treatment included multimodal management in contrast to manual therapeutic techniques, the results were proven to be more efficient with the manual therapy. On the other aspect, between the group analysis had shown that there is no significant difference amongst the effects of PRT and MFR techniques. Hence, the present study accepts the null hypothesis.

In current study analysis revealed that the pain in neck was found to be decreased to 1.02 from 7.22 in control group after ten days intervention which received US, TENS& hot pack, similarly

The overall result obtained from this study was based upon the NPRS, NDI, PPT and EMG scores, for the functional outcome. The scores were noted on day 1st and then on 5th and 10th day. Patients in group-A received multimodal treatment i.e. US, TENS and HP. When the pre and post-intervention results were compared, this group showed the significant improvement in NPRS, NDI, PPT and EMG scores. US is non-invasive method that therapeutically produces, thermal and non-thermal effects. US is used for tissue repair, reducing pain and muscle spasm.[22]

On the other hand, the single application of the burst type TENS produces an immediate effect to reduce the pain,[30] increases the blood flow in the muscles, improve the tissue oxygenation, and induce the muscle relaxation.[27]

Another possible mechanism for thermotherapy may involve hot fermentation to reduce muscle spasm, induce pain relief. It occurs as a consequence of reduced activity of the secondary afferent fibers. The pain can be reduced with reduction of painful inflammatory reactions on the consequence of increased blood flow to the area of MTrPs.[22]

The patients in group-B received conventional treatment along with MFR. The vasomotor responses helps to improves the blood flow to the affected area. It enhances the lymphatic drainage of toxic metabolic. The concept behind the improvement in the flexibility and an increase joint ROM can be that the fascia achieves the proper alignment of the muscle fiber and improves the joint mobility with the help of MFR.[29]

Group-C patients received multimodal treatment along with PRT. According to the proprioception theory, positioning the muscle in the position of ease for 90 seconds, reduces the tension of affected tissues and minimize the stimulation of affected proprioceptors in PRT.[1] PRT corrects the neuromuscular hyperirritability, muscular hypertonicity and reduces the tissue tension by fascial release. Hence, this technique helps to provide the relief of tenderness and local pain that is produced by TrPs.[23]

Our study indicates that EMG signal of the upper trapezius muscle having MTrPs generates the change in the amplitude of electrical signals, in comparison to the baseline. The results of this study showed that TrPs correlate with an increase in EMG amplitude. The relationship of the TrPs and sEMG advocated that increase in the muscle tension is an indication of presence of TrPs. Thus, this study helped out to reveal the EMG as an tool which can be used to diagnose and to analyse the MTrPs. On the other hand, the results indicated that both of the techniques were equally effective on the upper trapezius MTrPs.

5. KEY POINTS SECTION

FINDINGS- There was no significant difference between the effects of PRT and MFR techniques. Thereby, they were equally effective in reducing pain, improving neck ROM, and functional disability among the subjects with MTrPs on the upper trapezius muscle.

IMPLICATIONS- This study has provided the knowledge about the manual techniques, as MFR and PRT, both can be used in treating the trigger points of upper trapezius. Moreover, EMG is the tool that can be used to analyse the results.

CAUTION- The sample size was small and the duration of the intervention was only for 2-weeks.

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