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Original Research Article

COMPARATIVE EFFECTIVENESS OF LOW LEVEL LASER THERAPY, ULTRASOUND THERAPY AND COMBINED EFFECT OF BOTH ON TRIGGER POINTS

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ABSTRACT

Background: Positive effect of Low Level LASER Therapy (LLLT) and Ultrasound therapy (UST) have been studied before for Trigger Point. however combination of both LLLT and UST therapy have not been studied.

Objective: To compare the effect of LLLT, UST Alone each and combined therapy of both along with trigger point release on Trigger points through pressure pain threshold (PPT), Grades of tenderness.

Methods: 45 participants with at least one Myofascial Trigger Point were recruited and systematically assigned to one of three groups: UST (6 sessions), LLLT (3 sessions), both UST (6sessions) and LLLT (3sessions) along with trigger point release for all the groups. Outcome measures were assessed after one week treatment: pressure pain threshold (PPT) and Grades of Tenderness of trigger point.

Results: Pre and Post treatment values showed statistically significant results for all the groups. When comparisons were made within the groups, combined UST and LLLT showed significant results over US and LLLT alone.

Conclusion: The study demonstrated that combination of UST and LLLT is found to be effective. Thus administration of both modality as combined therapy for trigger point can be used for clinical purpose.

KEY WORDS: UST, LLLT, Trigger point, Pressure Algometer, Grades of Tenderness

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INTRODUCTION

Musculoskeletal disorders are the main cause of disability in the working-age population and one of the leading causes of disability in other age groups [1].

Trigger points was considered to be the primary cause of pain in 74% of 96 patients with musculoskeletal pain presenting to a community medical centre and in 85% of 283 patients admitted to a pain centre [2].

Trigger points (TPs) are discrete, focal, hyperirritable spots located in a taut band of skeletal muscle. These spots are painful on compression and can produce referred pain, referred tenderness, motor dysfunction, and autonomic phenomena. Trigger points helps to define myofascial pain syndromes [3].

Active trigger point are those which on

examination are consciously perceived by the patient as pain, even at rest, without activity or trauma. Latent trigger point are found on examination that are generally not consciously felt by the patient as anything more than discomfort, tension or stiffness for a majority of time unless exacerbated (aggravated by some physical activity). Latent trigger points are generally rated 1 or 2 and active trigger points are always rated 3 or 4 [4].

TPs are known to cause neck and jaw pain, low back pain, headaches, the symptoms of carpal tunnel syndrome and tennis elbow, and many kinds of joint pain mistakenly ascribed to arthritis, tendonitis, bursitis, or ligament injury. TPs may cause numbness, tingling, or lack of normal range of movement. TPs can also cause earaches, dizziness, sinus congestion, nausea, heartburn, and false heart pain which may further lead to depression if pain has been chronic [5].

Many researchers agree that acute trauma or repetitive micro trauma may lead to the development of a trigger point, prolonged poor posture, Sustained heavy lifting, sedentary lifestyles, de-conditioning, Muscle clenching and tensing due to mental/emotional stress, Injury such as a blow, strain, break, twist or tear, inactivity such as prolonged bed rest or sitting [6]. The trigger point count increased gradually with age, reaching maximum at age 70. Women had more tender points than men, Caucasians more than blacks. Isolated regional clusters of tender points occurred at the shoulder girdle in 7.8% and the knees in 7.4%. Correlation between tender points and associated peripheral joint tenderness was poor. Simons proposed a hypothesis of aetiology of MTrPs, were acute or chronic muscle overload leads to trauma to motor end plate and release of Acetylcholine (ACh). Excess amount of Ach results in contraction knot, which are in state of continued contraction and result in local ischemia and hypoxia. Increased energy demand in the face of loss of energy supply causes the release of sensitizing noxious substances, which are responsible for pain associated for MTrPs [7].

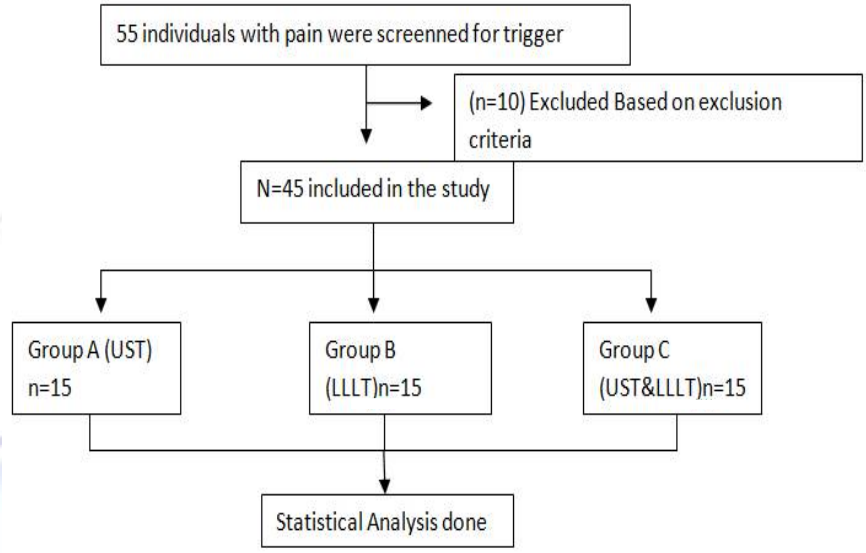
Although the diagnoses and treatment of Myofascial Pain being related to trigger points is yet to be included in most medical training. Most of the patients with musculoskeletal pain are still treated with the anti-inflammatory medications, muscle relaxants, anti depressant medications and/or strengthening programs. These may prove to be ineffective, if not detrimental, as trigger points may not respond to them and may be aggravated by further straining (strengthening exercises). Presently there is no evidence that any form of drug treatment eliminates Myofascial trigger points. NSAIDs and other analgesics usually provide moderate but very temporary symptomatic relief. Some physicians regularly administer trigger point injections [8].

Non pharmacologic treatment includes acupuncture, osteopathic manual medicine techniques, massage, acupressure, ultrasono graphy, application of heat or ice, diathermy, transcutaneous electrical nerve stimulation, ethyl chloride Spray and Stretch technique, dry needling.

Pressure Algometry is a useful technique in determining PPT measures, and has been used widely in both clinical and laboratory settings. Pressure algometry is predominantly a manual procedure that requires a perceptual response from the participant or patient. The reliability of PPT data is, therefore, dependent upon not only the application technique of the observer, but also the ability of the patient or participant to provide a consistent verbal indication of the PPT level [9].

MATERIALS AND METHODS

Patients: Study design was an experimental study. The study was conducted on local residents restricted to Belgaum city, province Karnataka, country India. Ethical committee approval was obtained from KLE Institutional Ethical Review Committee. Inclusion criteria were: 1) Adult age group 18 – 60 years; 2) Patients having tender/trigger point of grade 2 or grade 3. Exclusion criteria were:1) All contraindications for LASER and Ultrasound 2)Pregnancy 3)Tumors 4)Epipyseal plate 5)Implants 6)Acrylic bone glue used 7)Irritable skin around the area of treatment Outcome measures were 1)Pressure pain threshold 2)SOFT TISSUE TENDERNESS GRADING SCHEME used for assessment by palpation method



Method: Subjects were divided into 3 groups randomly by chit method (as given in Fig. 1).

Ultrasound therapy involved 1 Mhz intensity at pulsed mode for 5min (Fig. 2)

Low Level LASER Therapy involved Gallium-Aluminum-Arsenide laser wavelength 650 and 810 nm and power output of<500mW, relative humidity 80% with irradiation time of 10 minutes (Fig.3) Trigger point release for 90sec in each group following the treatment.

Fig-2

Fig-3

Statistical Analysis: SPSS software version 17 software was used for analysis.

RESULTS

The mean age group of subjects in this study was between 18- 60years. The mean age of the participants in ultrasound therapy was 34.33 years, LLLASER therapy was 25.27 and combined therapy group was 20.73years. The difference in mean age of three groups was statistically not significant.

Results state an improvement in Grades ofTenderness when within group scores were analyzed with p value <0.001 (Refer Table No.1). Statistical difference was noted when between groups scores were compared by Mann-Whitney U test. (Refer Table No.2) The results shown in table 3 states that significant improvement was also noted in Pressure Pain Threshold when within group scores were analyzed with p value <0.001. Statistical difference was noted when between groups scores were compared by Mann-Whitney U test (Table 4).

Table 1: Comparison of three groups (A, B, C) with grades of tenderness at before and after treatment by Kruskal Wallis ANOVA test.

Groups	Before treatment			After treatment			Changes		
	Mean	SD	Mean rank	Mean	SD	Mean rank	Mean	SD	Mean rank
Group A	3.67	0.49	22	1.53	0.52	26.97	2.13	0.35	18.23
Group B	3.6	0.51	20.5	1.6	0.74	26.53	2	0.76	17.5
Group C	3.87	0.35	26.5	1	0	15.5	2.87	0.35	33.27
H-value	2.75			10.804			17.053		
P-value	0.253			0.0050*			0.0001*		

*p<0.05

Table 2: Pair wise comparisons of three groups (A, B, C) with grades of tenderness at before and after treatment by Mann Whitney U test.

*p<0.05

Time	Groups	Mean	SD	Mean rank	U-value	Z-value	P-value
Before treatment	Group A	3.67	0.49	16	105	-0.3111	0.7557
	Group B	3.6	0.51	15			
	Group A	3.67	0.49	14	90	-0.9333	0.3507
	Group C	3.87	0.35	17			
	Group B	3.6	0.51	13.5	82.5	-1.2443	0.2134
	Group C	3.87	0.35	17.5			
After treatment	Group A	1.53	0.52	15.47	112	-0.0207	0.9835
	Group B	1.6	0.74	15.53			
	Group A	1.53	0.52	19.5	52.5	-2.4887	0.0128*
	Group C	1	0	11.5			
	Group B	1.6	0.74	19	60	-2.1776	0.0294*
	Group C	1	0	12			
Changes	Group A	2.13	0.35	16.23	101.5	-0.4563	0.6482
	Group B	2	0.76	14.77			
	Group A	2.13	0.35	10	30	-3.4219	0.0006*
	Group C	2.87	0.35	21			
	Group B	2	0.76	10.73	41	-2.9657	0.0030*
	Group C	2.87	0.35	20.27			

Table 3: Comparison of three groups (A, B, C) with pressure pain threshold scores at before and after treatment by Kruskal Wallis ANOVA test.

Groups	Before treatment			After treatment			Changes		
	Mean	SD	Mean rank	Mean	SD	Mean rank	Mean	SD	Mean rank
Group A	0.2	0.77	18.7	2.4	1.59	8.8	2.2	1.08	9.2
Group B	1.07	1.83	26.47	6.87	2.26	26.2	5.8	2.21	24.83
Group C	0.33	0.49	23.83	10.27	3.56	34	9.93	3.53	34.97
H-value	4.521			29.5			30.012		
P-value	0.104			0.0001*			0.0001*		

Table 4: Pair wise comparisons of three groups (A, B, C) with pressure pain threshold scores at before and after treatment by Mann-Whitney U test.

*p<0.05

Time	Groups	Mean	SD	Mean rank	U-value	Z-value	P-value
Before treatment	Group A	0.2	0.77	13.03	75.5	-1.5347	0.1249
	Group B	1.07	1.83	17.97			
	Group A	0.2	0.77	13.67	85	-1.1406	0.254
	Group C	0.33	0.49	17.33			
	Group B	1.07	1.83	16.5	97.5	-0.6222	0.5338
	Group C	0.33	0.49	14.5			
After treatment	Group A	2.4	1.59	8.67	10	-4.2515	0.0001*
	Group B	6.87	2.26	22.33			
	Group A	2.4	1.59	8.13	2	-4.5833	0.0001*
	Group C	10.27	3.56	22.87			
	Group B	6.87	2.26	11.87	58	-2.2606	0.0238*
	Group C	10.27	3.56	19.13			
Changes	Group A	2.2	1.08	9.2	18	-3.9197	0.0001*
	Group B	5.8	2.21	21.8			
	Group A	2.2	1.08	8	0	-4.6663	0.0001*
	Group C	9.93	3.53	23			
	Group B	5.8	2.21	11.03	45.5	-2.779	0.0055*
	Group C	9.93	3.53	19.97			

DISCUSSION

As expected in above study, all groups experienced reduction in pain over the duration of a week confirming that, Ultrasound, LLLASER as standalone treatment are effective however there has been significant effect of Ultrasound and LLLASER both as combined therapy on trigger points.

In the present study, we compared the results obtained after a six sessions of therapeutic Ultrasound, three sessions of LLLASER therapy and three sessions of LLLASER and therapeutic Ultrasound both on Latent trigger point. However there have been studies reporting Ultrasound and LLLASER as standalone therapies effects on trigger point [10], there is no evidence that LLLASER and Ultrasound can be used effectively as combined therapy in clinics to release trigger point.

Acute or chronic muscle overload results in trauma to the motor end plate and subsequent release of acetylcholine. Excessive amount of acetylcholine result in formation of contraction knots which are in state of continued contraction and result in local ischemia and hypoxia. The combination of increased energy demand in the face of loss of energy supply causes the release of sensitizing noxious substances, which are proposed to be responsible for the pain associated with myofascial trigger point [2].

Therapeutic ultrasound is commonly used in the management of different forms of musculoskeletal pain as has ability to decrease short-term local trigger-point sensitivity. It is an inexpensive, non-ionizing form of radiation that is easily integrated and is non invasive than traditional needle therapy. Ultrasound therapy evokes short-term segmental antinociceptive effects on trigger points which may helps in the management of musculoskeletal pain [11].

LLLASER therapy has been used widely in treatment of skeletal muscle disorders with positive result. The light tissue interaction leads to analgesic and anti-inflammatory effects and also provides tissue healing. Laser irradiation stimulates collagen production, alters DNA synthesis, and improves the function of damaged neurological tissues. Low level laser therapy improves local microcirculation, it can also improve oxygen supply to hypoxic cells in the trigger point areas, at the same time it remove the collected waste products. With this perception in mind we can expect that LLLASER therapy in addition to trigger point release will significantly decrease pain. Previous studies have confirmed the utility of low level laser in the treatment of myofascial trigger points [12].

Manual pressure release (MPR) is one of the techniques used to treat myofascial trigger points. Simons (2002) has proposed that MPR may equalize the length of sarcomeres in the myofascial trigger point and consequently decrease the palpable knot and pain. Another study by Hou et al (2002) suggested reduction in pain in myofascial trigger point from reactive hyperaemia in the local area, due to counter-irritant effect or spinal reflex mechanism that may produce reflex relaxation of the involved muscle.

The use of push pull gauge algometer fitted by a metal rod with a rubber disc tip with surface of $1cm^2$, pain sensitivity in response to the steady application of pressure for 30-40 sec was shown to change as subject experienced maximum pain to no pain on application of pressure using pressure algometer. This increase in pressure was found to be significant ($p<0.001$).

Studies have been done by dilpreet et.al on Combination of low level laser therapy and ischemic compression proved more effective treatment in latent myofascial trigger points than ischemic compression alone [13].

L.A. Matsutani found that stretching exercises program is efûcient to reduce pain and painful sensibility at tender points, thus enhancing patient's quality of life. Laser therapy has not shown advantages when added to muscle stretching exercises [14].

The current study can be used in clinics to treat patients with referred pain. LLLASER therapy (3 sessions) and ultrasound therapy (6 sessions) as combined therapy for a week can be used to treat patients followed by MPR (60 sec). other outcome measures for pain and disability could be taken for further assessment(eg. Visual analog scale, McGill pain questionnaire) in addition to grades of tenderness and pressure

pain threshold. It could be confirmed whether referred pain diminishes from above treatment or whether there is only local effects on pain sensitivity.

The limitation of current study is the inconsistency of pain perception within a subject may affect the PPT measurement. There is no follow up hence duration of treatment effect remains unknown.

Conflicts of interest: None

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