Journal of Pharmaceutical Research International

34(32A): 59-70, 2022; Article no.JPRI.86289
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Effects of Low Level Laser Therapy Vs Ultrasound Therapy in the Management of Active Trapezius Trigger Points

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2022/v34i32A36109

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/86289

Original Research Article

Received 05 February 2022
Accepted 15 April 2022
Published 19 April 2022

ABSTRACT

Background: Trigger point is a extremely irritable local spot of exquisite tenderness in the nodule within the tangible taut muscle band. The prevalence studies have shown that the occurrence of myofascial trigger point in the general population.
Objective: The aim of the study was compare the effects of low level laser therapy(LLLT) Vs ultrasound therapy in the management of active trapezius trigger point.
Methodology: The participants will be allocated into two groups using simple random sampling. One group has to be given Low level laser therapy (LLLT) and Moist Heat and other group treated with US and Moist Heat. Both group receive treatment for 3 times a week. Total number of 9 session has to be given in 21 days. The outcome measure has to be taken at the first day and end of the day.
Conclusion: Based on the above results we conclude that Low Level Laser Therapy can be used as a therapeutic device in the management of Active Trapezius Trigger points.

Keywords: Trigger point; laser therapy; ultrasound.

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1. INTRODUCTION

Myofascial Trigger Points are the hyperirritable spot that situated within a taut skeletal muscle band that painful when trampled or stretched. This can also result in typical motor, sensory and autonomic components which disturbed motor function, muscle weakness, muscle rigidity, localized tenderness, referral pain, peripheral and central sensitization [1]. The incidence of neck pain associated with trapezius trigger points was around 150 to 200 per 1000 cases per year. Disabling neck pain is in 10% of men and 18% of women in this population. Over 11% of Ontario workers claimed lost-time benefits due to neck pain [2].

This produces a sustained partial depolarization of the post junctional membrane which causes a sustained contraction of the muscle. With the increased contraction accumulation of metabolic waste, hypoxia and ischemic sets in calcium re-absorption pump failure contribute to a period of energy crisis due to depletion of Adenosine triphosphate and vice versa. The above-mentioned cascade of events trigger, the formation of trigger point or activation leading to release of nociceptive material which may be the reason for referred pain pattern or local tenderness and pain enhancing muscle retention and loss of strength leading to further stretching and muscle overloading. This vicious cycle keeps on producing pain and spasm. These associated physiological findings are increased production of acetylcholine (Ache), changes in the metabolism of calcium. Excess calcium release, hypertension, pain, Neurological hyper-stimulation localized [3].

A number of stimulants, such as forcing muscle activity through pain, can cause an active trigger point. This situation is more common when the post road-traffic accident activity which multiple and diffuse trigger points may form. Trigger points are characterized by symptoms such as severe neck pain, stiff neck, reduced range of motion, weight aversion on your arms, tension headache, back pain in the middle, pain in the upper shoulder area. Ultrasound, Dry needling, massage, Ischemic compression, Laser and Acupressure are the methods used for treating the trigger points [4].

Laser therapy is a non - Invasive technique to reduce pain. It can be used for pharmaceutical drugs as an adjunct or a replacement. This functions as a relaxing analgesic muscle and is useful in treating musculoskeletal disorders, assists in tissue healing and has effects on bio stimulation. Laser therapy works by stimulating repair of ligaments. There is some alternative suggestion that laser inhibits the transmission of A delta and C fibres and that laser-induced neural blockages can lead to long-term nociception. Therefore, repeated use of laser will minimize tonic peripheral nociceptive afferent input into the dorsal horn resulting in pain modulation [5,6,7].

Ultrasound is applied on the surface of the skin by using extremely high frequency sound waves between 800,000 Hz and 2,000,000 Hz, which humans cannot detect. The therapeutic ultrasound was commonly used to manage a variety of conditions [8,9,10].

2. METHODOLOGY

2.1 Trail Registration

After the trail commencement we applied for trail registration in 2019 Referral NO. REF/2019/08/027870 and Reg. no CTRI/2019/08/020957.

2.2 Study Design

This is a Randomized Control Trial study. This trial was carried out through out for 1 year from March 2019 to March 2020. This study was conducted in Nitte Institute of Physiotherapy and Outpatient physiotherapy department of justice K S Hegde charitable hospital, Deralakatte, Mangalore.

2.3 Inclusion Criteria

In this study male and female are participated, The age limit is 18- 60 years and Patients participated with who have Active Trapezius Trigger points.

2.4 Exclusion Criteria

In this study we excluded patients with neurological signs, Hyper sensitive skin, Any previous history of surgery, Any psychiatric disorders and patients who are receiving any other treatment.

2.5 Randomization

Block randomization method in a 1:1 allocation ratio

2.6 Sampling method

Simple random sampling

2.7 Sample Size

n = 23 per each group Total sample size = 46

calculated by estimation of single proportion by using the formula

$$n = \frac{Z^2_{1\alpha/2}\, p(1-p)}{d^2}$$

3. PROCEDURE

In this study 46 Subjects were selected for the study. Subjects were separated in to two groups by means of computer based randomization after fulfilling the inclusion criteria and Subjects had signed an informed consent form. Each group was containing of 23 subjects. Demographic data have to collect with pre- treatment base line data of VAS and PPT. One group has to be given LLLT and Moist Heat and other group treated with US and Moist Heat. Both group receive treatment for 3 times a week. Total number of 9 session has to be given in 21 days. The outcome measure has to be taken at the first day and end of the day.

Protocol For Group A (Therapeutic Low Level Laser) Moist heat can be applied first for 10 - 15 minutes, Before starting the laser therapy treatment instruction was given to the Patient about the machine and was instructed to avoid direct eye contact Into laser beam, Eye protection device was also given. Group A received Low level laser therapy were evaluated for areas of restriction. The treatment area was cleaned using cotton and saline. The treatment was applied by the therapist standing at the side of the patient. Patient's position is high sitting with back rest. The Participants got treatment three times a week for 3 consecutive weeks. Machine was used in this study is Class 3B Single diode IR Laser, manufactured by Medical Italia. Wave length - 904 nm. Treatment time was 90 sec.

Protocol For Group B (Therapeutic Ultrasound) Moist heat can be applied first for 10 - 15 minutes, before starting the Therapeutic Ultrasound therapist need to evaluate for areas of restraint. The area was cleaned using cotton and saline. Patient's position is high sitting with back rest. The subject received treatment 3 times a week for 3 consecutive weeks. Machine was used in this study is Electroson 608, manufactured by Techno med Electronics. Intensity range from 0.1 to 1.5 watts/ cm^2 and Treatment time is 7 minutes.

4. OUTCOME MEASURES

Pressure Pain Threshold: Algometer is a tool used to evaluating severity of pain. Its measure the amount of pressure required to cause pain. It is useful method to access the outcome of treatment on trigger point.

Visual Analogue Scale: It is used for the valuation of pain intensity. It comprise of 10 cm line with zero on one end (no pain) and 10 cm on other end (intolerable pain) and patients marks the level of his/her pain. Visual Analogue Scale is a simple pain measurement tool. It can be used to measure severity and improvement of pain,

5. RESULTS

5.1 Statistical Analysis

- The obtained data was evaluated using SPSS software version 16.0.
- The socio-demographic details (Age, gender, occupation, education, marital status, residence) were analysed by using Descriptive statistics.
- Since the data is normally distributed then mean and standard deviation was used for analyzing the variables
- A p-value of less than 0.05 considered significant for the study.

Table 1: shows the gender wise distribution of the subjects in both the groups, in which p value is >0.05, hence gender is homogenous in nature.

Table 2: shows the demographic and baseline characteristics using independent t-test and p value is >0.05, so baseline characteristics, Age, VAS, PPT are homogeneous in nature.

Table 3: shows the results of VAS in between group comparison of participants with active trapezius trigger point. VAS scores of pre-treatment showing mean difference of 0.173 and

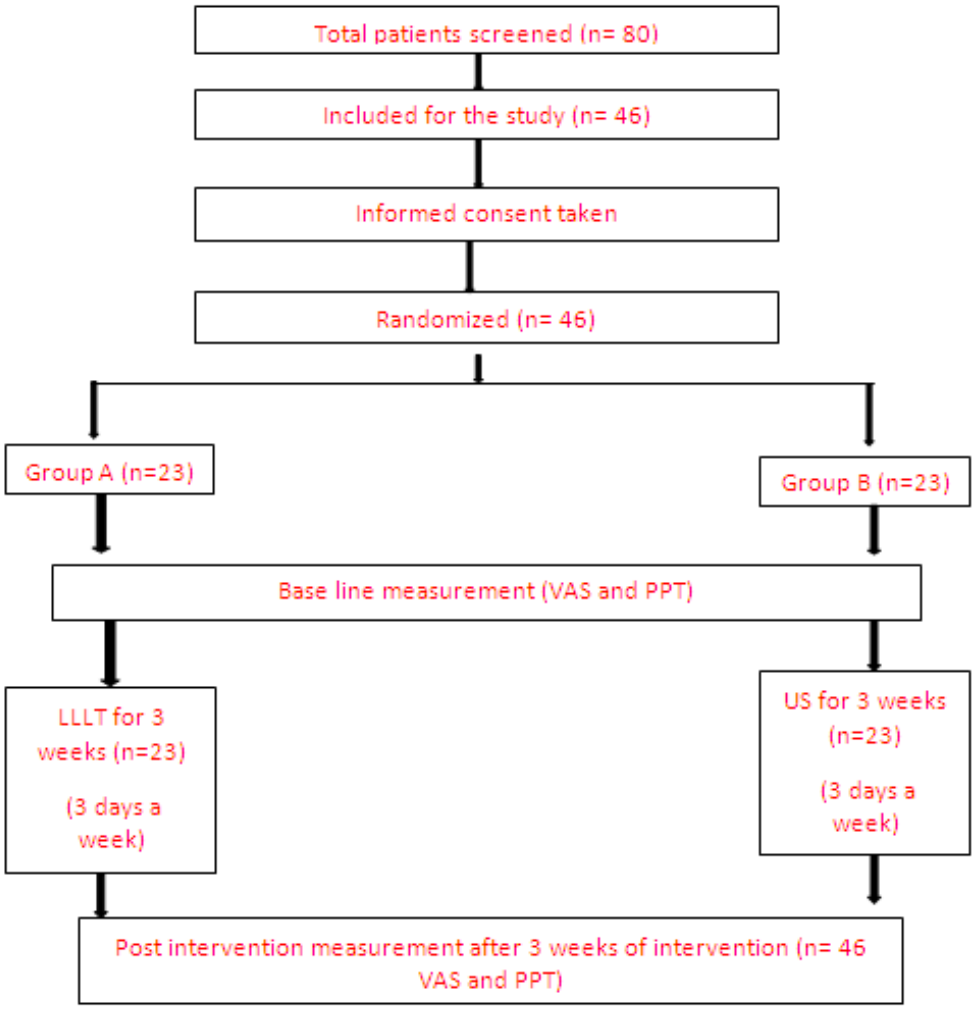
t value of 0.74 with p value of 0.45, there is no significant changes and p value is >0.05. However, in VAS post-treatment showing means difference of -1.52 and t value of -6.17 with p value of <0.05 which shows a significant change from post to pre-treatment.

Table 4: shows the results of PPT in between group comparison of participants with active trapezius trigger point. PPT scores of pre-treatment and post treatment showing mean difference of -0.021, 0.391 and t value of -0.12, 2.01 with p value of 0.90 and 0.50 which shows there is no significant changes and p value is >0.05.

Table 5: shows the results of LLLT of VAS and PPT in within group comparison of participants with active trapezius trigger point. LLLT shows mean difference of 5.08 and -2.24 with t value of 24.49 and -17.9 showing significant changes with p value <0.05

Table 6: shows the results of UST of VAS and PPT in within group comparison of participants with active trapezius trigger point. UST shows mean difference of 3.39 and -1.83 with t value of 15.11 and -11.5 showing significant changes with p value <0.05.

Table 7: shows the absolute mean differences for outcome measures of LLLT Group Scores are much higher than the UST group. P values are p<0.05 for LLLT Group. Results table states that, absolute difference of VAS Scores and PPT Scores of LLLT Group is statistically significant from UST group.



Patients flow chart: 1

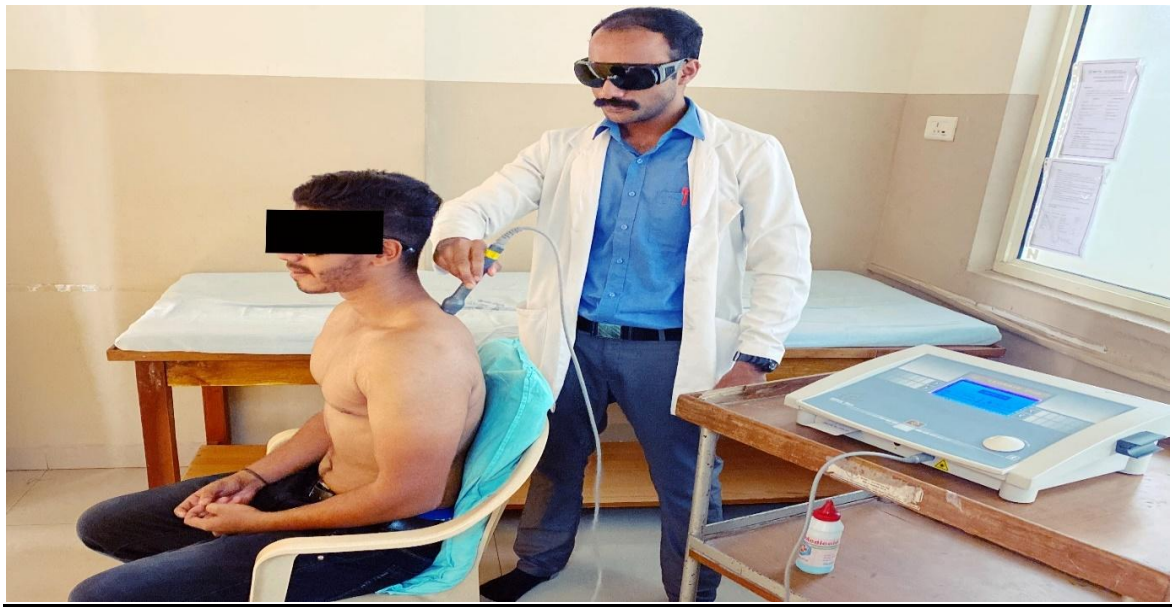


Fig. 1. Patient receiving low level laser therapy

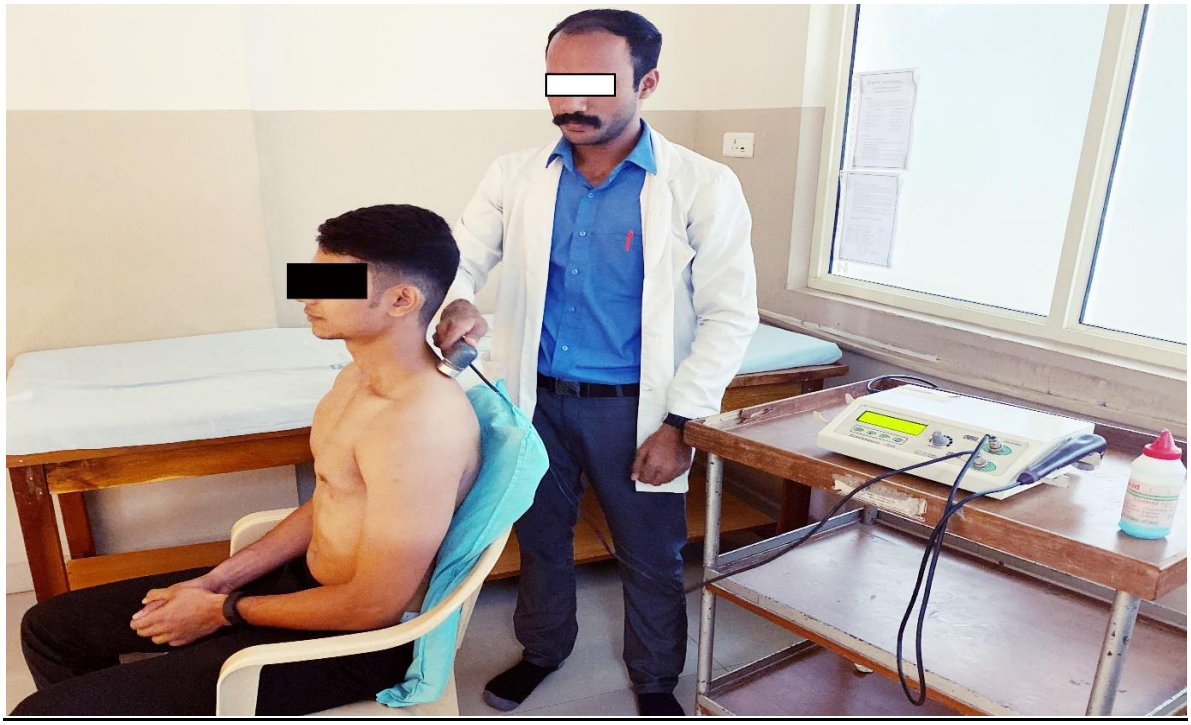


Fig. 2. Patient receiving ultrasound therapy

Table 1. Gender wise distribution of the subjects

		Sex		
		Female	**Male**	**Total**
Group	A (Low level laser therapy)	7	16	23
	B (Therapeutic Ultra sound)	10	13	23
Total		17	29	46

Table 2. Base line characteristics of participants with active trapezius trigger points

	Group A(n=23) (LLLT)		Group B(n=23) (UST)		Mean Difference	95 % cl for the Difference			
Characteristics	**Mean**	**SD**	**Mean**	**SD**		**Lower**	**Upper**	**t**	**P -value***
Age	24	1.16	23.39	1.305	0.60870	-0.127	1.344	1.6	0.10
VAS pre	7.78	0.6712	7.60	0.891	0.17391	-0.294	0.642	0.7	0.45
PPT pre	3.24	0.6258	3.26	0.563	-0.02174	-0.375	0.332	-0.1	0.90

Table 3. Between groups Comparison VAS score of participants with active trapezius trigger point

Outcome measure	**Group A(n=23) (LLLT)**		**Group B(n=23) (UST)**		**Mean Difference**	**95 % cl for the Difference**		**t**	**P– value***
	Mean	**SD**	**Mean**	**SD**		**Lower**	**upper**		
VAS pre	7.7	0.67	7.6	0.89	0.173	-0.29	0.64	0.74	0.45
VAS post	2.69	0.82	4.21	0.85	-1.52	-2.01	-1.02	-6.17	0.01*

Table 4. Between group Comparison PPT score of participants with active trapezius trigger point

Outcome measure	**Group A(n=23) (LLLT)**		**Group B(n=23) (UST)**		**Mean Difference**	**95 % cl for the Difference**		**t**	**P- value**
	Mean	**SD**	**Mean**	**SD**		**Lower**	**upper**		
PPT pre	3.24	0.62	5.49	0.68	-0.021	-0.37	0.33	-0.12	0.90
PPT post	5.49	0.68	5.10	0.62	0.391	-0.0008	-0.0009	2.01	0.50

Table 5. Within group Comparison of VAS and PPT in LLLT in participants with active trapezius trigger point

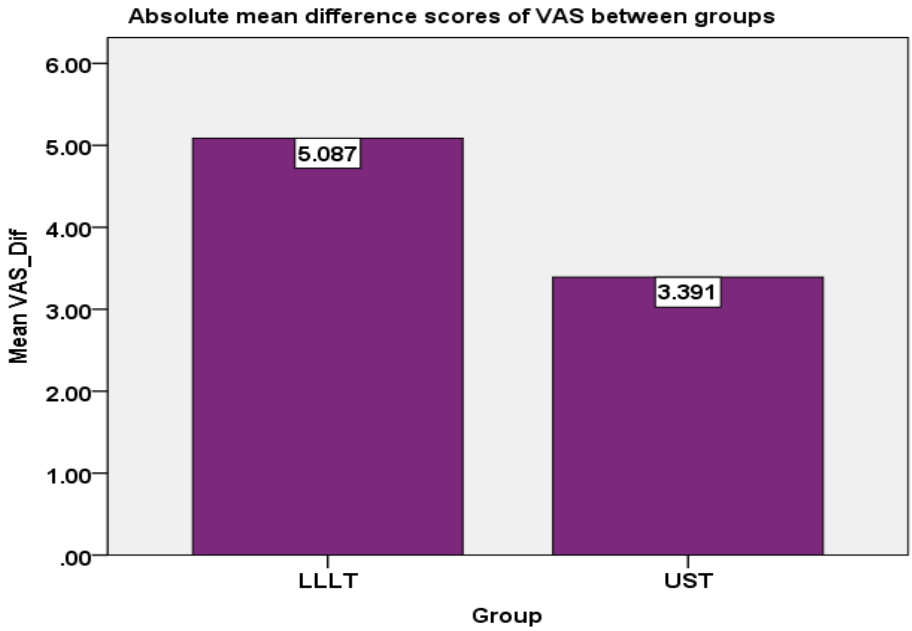
GROUP			n	Mean	SD	Mean Difference	95 % cl for the Difference		df	t	P -value[+]
							Lower	Upper			
LLLT	Pair1	VAS Pre-VAS post	23	7.78 2.70	0.67 0.82	5.08	4.65	5.51	22	24.49	0.001[*]
	Pair2	PPT pre-PPT post	23	3.25 5.49	0.62 0.68	-2.24	-2.50	-1.98	22	-17.9	0.001[*]

Table 6. Within group Comparison of VAS and PPT in UST in participants with active trapezius trigger point

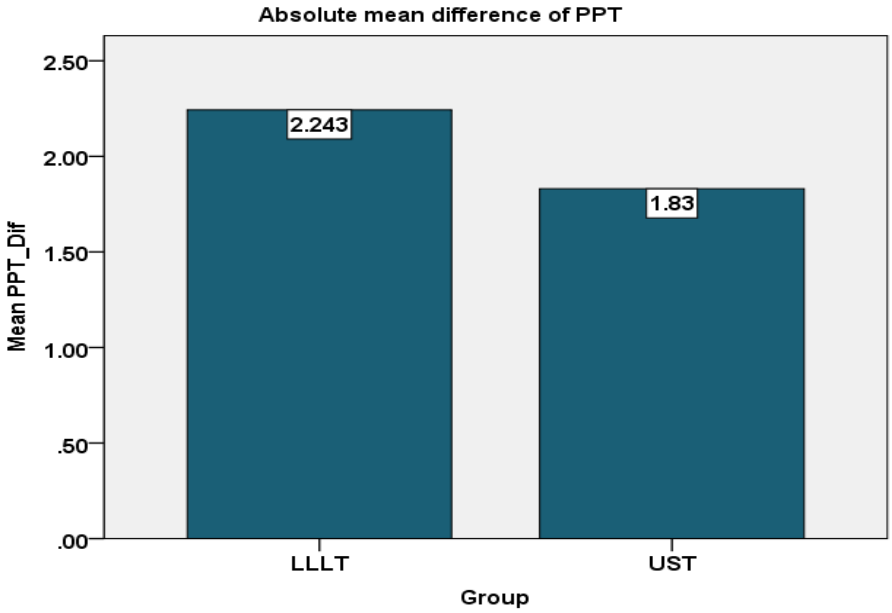
GROUP			n	Mean	SD	Mean Difference	95 % cl for the Difference		df	t	P -value[+]
							Lower	Upper			
UST	Pair1	VAS Pre-VAS post	23	7.61 4.22	0.89 0.85	3.39	2.92	3.85	22	15.11	0.001[*]
	Pair2	PPT pre-PPT post	23	3.27 5.10	0.56 0.62	-1.83	-2.15	-1.50	22	-11.5	0.001[*]

Table 7. Absolute difference of outcome measure were reported witch group is significant

Outcome measures	Group A(n=23) (LLLT)		Group B(n=23) (UST)		Mean Difference	95 % cl for the Difference		t	P-value*
	Mean	SD	Mean	SD		Lower	upper		
VAS Difference	5.08	0.99	3.39	1.07	1.69	1.07	2.31	5.54	0.001*
PPT difference	2.24	0.59	1.83	0.74	0.41	0.011	0.81	2.07	0.44



Graph 1. Absolute mean differences of VAS scores are significant high for LLLT group(5.087), than UST group (3.391)



Graph 2. Absolute mean differences of PPT scores are significant high for LLLT group (2.243), than UST group (1.83)

6. DISCUSSION

The aim of the study was to compare the effects of LLLT and UST in the supervision of Active trapezius trigger point. Trapezius trigger points are leading cause for pain and disability in general population with high prevalence. Numerous studies have been showed, with an goal to release this pain. Recruitment occurred over one year period so many patients screened to achieve a target of 46 patients for the study. In the present study, Group A received low level

laser therapy and moist heat and Group B received ultrasound therapy and moist heat for active trapezius trigger point for 3 weeks. In group A (LLLT+ MH), was showing statistically significant difference in both VAS and PPT values after 3 weeks of intervention after within group comparison.

Agung et al suggested that mechanisms of pain reduction in retort to low- level laser therapy may include amplified local and systemic microcirculation impeding the creation of ischemia- mediated inflammation in response to Low- level laser therapy. Reducing pain tolerance once laser therapy is administered will also be allied with increase oxygen delivery to hypoxic tissue. A rise in nitric oxide is also associated with increased blood flow, which expands the blood vessel diameter. Laser therapy improved local and systemic nitric oxide release and inhibit certain inflammatory mediators [11].

In another study laser inhibit A delta and C fibre transmission. Hence, the repeated application of laser may diminish tonic peripheral nociceptive afferent effort to the dorsal horn and facilitate reorganization of synaptic connections in the central nervous system producing pain modulation (12,13,14). Within group analysis for group B (UST+ MH) showed statistically significant difference in both VAS and PPT values after 3 weeks of intervention. **Dilek D et al** In this study improvement was noted with Ultrasound treatment, this was due to the thermal effects achieved, which leads to increase in the collagen temperature and thus improving the elasticity of the tissue. With the improved properties of the muscle fibres there is better alignment of the collagen fibrils causing changes in the length tension relationship of the longitudinally oriented fibres, thus leading to an even distribution of forces and decreasing stress on the injured localized areas of tissues. Ultrasound also stimulates the mechano transduction pathways, and thus enhanced calcium signalling [15,16,17].

In another study by **Saunders et al** stated that UST stimulates mast cell and release histamine. It also activates macrophages and accelerates the normal recovery of inflammation that has been shown to boost the extensibility of mature collagen by encouraging remodelling of fibre, which leads to increased elasticity without any loss of Strength. This study is in accordance with our study [18,19]. Between groups analysis depicts that Low level laser therapy was proven to be more effective than ultrasound for the treatment of Active trapezius trigger. Absolute mean differences of PPT scores are significant high for LLLT group (2.243), than UST group (1.83). Absolute mean differences of VAS scores are significant high for LLLT group (5.087), than UST group (3.391).

7. CONCLUSION

It is concluded that, we reject the null hypothesis and accept the alternative hypothesis which states that there may exist substantial variance in the effects of LLLT vs UST in management of active trapezius trigger points. We concluded that the therapy for active trapezius trigger point by low level laser therapy and ultrasound therapy within the group both are significant.

STRENGTH OF THE STUDY

Current study there is no side effect in which there is no dropout noted and we used reliable tool to tenderness measurement.

LIMITATION OF THE STUDY

The intervention period was only for 3 weeks and we used Disability scales and there is a lack of long term follow up.

SCOPE FOR FUTURE WORK

Future scopes of studies including long term follow up and also Future studies can incorporate disability scales.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

A written informed consent with method study purpose, potential risk, benefits were explain to the patient, after that each patient was asked to sign the consent form.

ETHICAL APPROVAL

The Members of ethical committee reviewed trial protocol, therefore, permitted to conduct the study.

Ref No. NIPT/IEC/Min/001/2018-19 dated 11-03-2019.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/86289