



Research Article

A COMPARISON OF LOW-LEVEL LASER THERAPY VERSUS ULTRASOUND THERAPY IN TRIGGER POINT RELEASE FOR CHRONIC TENSION HEADACHE

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ABSTRACT

Background: Myofascial trigger points can be defined as the hyperirritable spot in the skeletal muscle that is associated with hypersensitive palpable nodule in a taut band. Myofascial trigger point is associated with pain on compression and the pain is typically of referred type. Trigger points helps to define myofascial pain syndrome. Myofascial painsyndrome is the common cause for tension headache. Chronic tension headache is headache which lasts for more than 30 min to 7 days. Various studies proved low-level laser therapy and ultrasound therapy as effective in the treating trigger points. But there are no studies comparing the effect of low-level laser therapy and ultrasound therapy in the treatment of chronic tension headache.

Objective: To compare the effects of low-level laser therapy and ultrasound therapy in subjects with chronic tension headache in reducing pain and improving function.

Study Design: Experimental study design.

Subjects: 20subjects, age group between 18-30 years, both men and women were included in the study.

Intervention: 10 subjects in Group-A received low-level laser therapy with pre-andpost-test and 10 subjects in Group-B received ultrasound therapy.

Outcome Measures: Algometer for pain measurement, Neck disability scale for functional outcomes.

Results: There was a significant reduction in pain scores from 0.830-1.374 ($p < 0.05$). There was a significant reduction in disability from 23.80 -8.70 ($p < 0.05$).

Conclusion: The present study concluded that application of low-level laser therapy has decreased pain and improving function in chronic tension headache.

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INTRODUCTION

Myofascial pain syndrome is characterized by pain originating from trigger points at muscles and fascia associated with muscle spasm, referred pain patterns, and stiffness, restricted range of motion, fatigue, and sometimes autonomous dysfunction of the related region.1-3Myofascial pain syndrome is the most common reason for tension type headache.4

The presence of myofascial trigger points in the affected muscle is one of the main characteristics of this syndrome.

Trigger points are discrete, focal, hyperirritable spots located in a taut band of skeletal muscle.4the spots are painful on compression and can produce referred pain, referred tenderness, motor dysfunction, and autonomic dysfunction. Referred pain is important characteristics of trigger point.4Myofascial trigger point are classified into active and latent trigger points. An active myofascial trigger point can found to trigger locally and it reproduces complaint

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such as head, ears, mandible, temporomandibular joint, teeth, eyes, neck, etc. or as referred pain.5-8A latent myofascial trigger point does not trigger pain without being stimulated.8In the head and neck region with trigger points can manifest as tension headache. Among the many types of headache disorders, tension-type headache is one of the most prevalent in adult.9Many researchers agree that acute trauma or repetitive micro traumamay lead to the development of a trigger point, Prolonged poor posture, sustained weight lifting, sedentary lifestyles, muscle clenching and tensing due to mental/emotional stress, injury such as blow ,strain,break,twist or tear, inactivity such as prolonged bed rest or sitting may also cause trigger points.10

During manual palpation the tender muscles are harder and have a thick consistency than normal muscles. The trapezius muscle shows higher degree of pain and triggers than other areas in patients with chronic tension headache.11Direct factors which include in the myofascial trigger points is injury to the muscle (macro trauma), repeated micro trauma caused by para-functional habits and inadequate posture or occupational /recreational activities that produce repetitive strain on a muscular group of muscles.

Indirect factors include nutritional deficiencies, sedentary life style, sleep disorders, and a continual source of profound pain and emotional tension.

Moreover other metabolic and endocrine disorders (anemia, hypoglycemia and hypothyroidism) should also be researched, along with psychological and behavioral aspects.

A number of factors which influence the trigger tension headaches are stress, insomnia, changes in sleep routine, depression, anxiety, skipping meals, uncomfortable body position for a prolonged time, prolonged sitting with improper position.

Tension-type headache (TTH) is an ill defined and heterogenous syndrome, which is diagnosed mainly by the absence of features found in other headache type, such as migraine. The term tension-type was coined by the first classification committee of the International headache society 12 which indicates that some kind of mental or muscular tension might have a causative role.

Tension type headache is classified into three subtypes according to headache frequency,

Infrequent episodic TTH (<1 day of headache per month)
Frequent episodic TTH (1-14 days of headache per month)
Chronic TTH (>15 days per month).

Chronic tension-type headache CTTH is characterized by mild to moderate bilateral pain occurring either in episodes of variable duration or continuously. The diagnostic criteria require an occurrence of more than 15 days per month, 180 days per year) for more than 3 months.

In the head and neck region trigger points can manifest as tension headache. The aim is to regulate physiological cell functions, mediate inflammatory processes enhance, the tissue repair process, and promote analgesia in cases of acute or chronic pain.

Pressure algometry is a useful technique in determining pressure pain threshold for the chronic tension headache subjects. The reliability of pressure pain threshold data is therefore dependent upon not only application technique of the observer but also the ability of the patient or participant to provide a consistent verbal indication of the pressure pain threshold.¹³

Ultrasound produces deep heat to the targeted area causing local muscle relaxation^{14,15,16} it was reported that heating and an increase in tissue temperature is usually associated with vasodilatation and thus an increase in blood flow to the area. It can be resolution of pain muscle-guarding spasm.¹⁷ The ultrasound produces the thermogenic effect which results in a transient increase in the flexibility of dense collagenous structures such as tendons, ligaments and joint capsules, which consequently decreases the stiffness of the joint, pain and accompanying muscle spasm and increases the blood flow temporarily.¹⁸

Low level laser therapy has been safely used in the treatment of myofascial pain syndrome with its analgesics, myo-relaxant, tissue healing, and bio-stimulation effects.¹⁹⁻²²

The aim is to regulate cell functions²³ mediate inflammatory process, and promote analgesia in cases of acute and chronic pain.²⁴⁻²⁷ when applied to the region of myofascial trigger

points; laser therapy improves local microcirculation, favors the supply of oxygen to cells with hypoxia and helps remove the waste products of cell metabolism thereby reducing the pain.

METHODOLOGY

Study Design: Experimental

Study Type: Comparative type

Sampling Meth: ORandom sampling

Sample Size 20 **study Duration:** 4 weeks

Study Setting Srm: medical college hospital and research centre, SRM Institute of Science and Technology

Inclusion Criteria

Both men and women included Age between 18-30 years
Subjects who fulfill the International headache society classification criteria
Palpation of a trigger point elicits a referred pain specific to that muscle
Identification of a palpable taut band

Exclusion Criteria

Areas with hypoesthesia Not to irradiate tumors directly
Dental Implants

Spinal cord compression Disc prolapsed Cervical fracture

Procedure

Informed Consent was taken to participate in the study. Subjects those with tension headache referred by a physician or from headache clinic were considered. The subjects were selected on the basis of inclusion and exclusion criteria.

The procedures had been clearly explained to the subjects. Sample sizes of 20 subjects were selected with the age group between 19 -30 years, both men and women were taken with ten subjects in each group (Group A and Group B respectively).

Group A subjects treated with Low Level Laser Therapy and Group B subjects were treated with Ultrasound therapy.

Each group consisted of 10 subjects, Pre and post measurements were conducted on both groups by using Algometer to measure the pressure pain threshold over the trigger points (trapezius, suboccipitalis muscle) for both pre and post treatment and Neck Disability Index scale was used to evaluate the functional outcomes. Over a period of four weeks, a total of 12 treatment sessions is given on alternate days.

Subjects will be in a relaxed position during the treatment. Both the group subjects were advised about relaxation position that are provided in handouts with suitable pictures as a part of ergonomics.

Low-Level Laser Therapy

The method of application: Probe method.

Intensity : 12J.

Duration : 50 seconds, thrice a week for 4 weeks

Wavelength : 980 nm

Ultrasound Therapy:

Frequency : 1MHz

Intensity : 1.5 W/cm²

Duration : 6 Minutes, thrice/week for 4 weeks

Technique of Application : Direct contact method

Mode of Application : Continuous

The method of Application : Circular method

Home Program Exercises

Before starting the exercises relax your shoulders.

Lying Position

Try to lie with your head and neck in a fairly straight line. Lying on your back, gently roll your head from side to side. Lying on your front, try lifting your head to look at the ceiling a few lines.

Sitting Position

1. Sit with your head fairly straight.
2. Lift your head and try to look at your knees. Hold for a few seconds, and then relax.
3. Sitting upright, move your head towards each shoulder in turn.
4. Move your head left and right.
5. Gently move your head backwards and forwards.

Lateral neck stretch

Take the head over to the side and apply further pressure using the hand as shown to increase the stretch.

Posterior Neck Stretch

Tuck the chin in and tilt the head down towards the chest. Use another hand to apply pressure on the head if necessary.

1. Ultrasound apparatus
2. Ultrasound gel such as Aqua sonic gel
3. Laser apparatus
4. Glass
5. Algometer
6. Stool
7. Cotton
8. Bed
9. Pillow
10. Bed sheet

Outcome Measures

Algometer for pain measurement.
Neck disability index scale for functional outcomes.

Data Analysis

The statistical package for social science IBM SPSS version 20 for Windows was used for data analysis. The statistical tool used in this study was the paired 't' test, Independent t-test. Paired 't' test was used for analysis of pre-test and post-test means within the groups; whereas independent t-test was used for analysis of the comparison between the 2 groups.

Table 1 Pre-test and Post-test mean values of pain measured by Algometer and neck disability measured with Neck Disability index questionnaire among Group A Chronic Tension Headache patients treated with LASER therapy (N=20) for a period of four weeks.

Laser Group-a	Mean	N	SD	Paired 't' Test	P Value	
Ndi questionnaire	Pre- Test	23.80	10	4.894	16.336	0.000
	Post- Test	8.70	10	2.627		
Algometer	Pre- Test	0.830	10	0.094	-10.317	0.000
	Post- Test	1.3740	10	0.155		

P<0.05

According to Table 1, the pre-test mean value of Neck disability index questionnaire score is 23.80 and the post-test mean value is 8.70, which shows significant changes in Neck disability index questionnaire with Low-Level Laser Therapy (LLLT) treatment.

Pre-test mean value of Algometer is 0.830 and the post-test mean value is 1.3740, which explains that there is a significant reduction in pain with Low-Level Laser Therapy (LLLT) on chronic tension headache with P value of 0.000. (p <0.05)

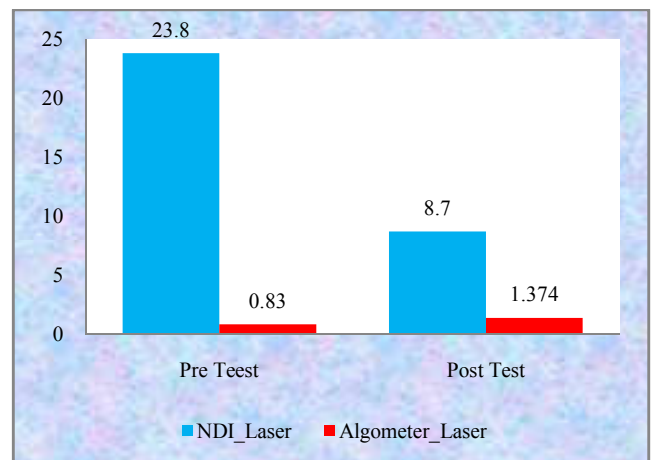


Figure 1 Application of Low-Level Laser Therapy to the trigger points.



Figure 2 Application of Ultrasound Therapy to the trigger points.

Materials Used



Graph 1 Pre-test and Post-test mean values of pain measured by Algometer and neck disability measured with Neck Disability index questionnaire among Group A Chronic Tension Headache patients treated with LASER therapy (N=20) for a period of four weeks.

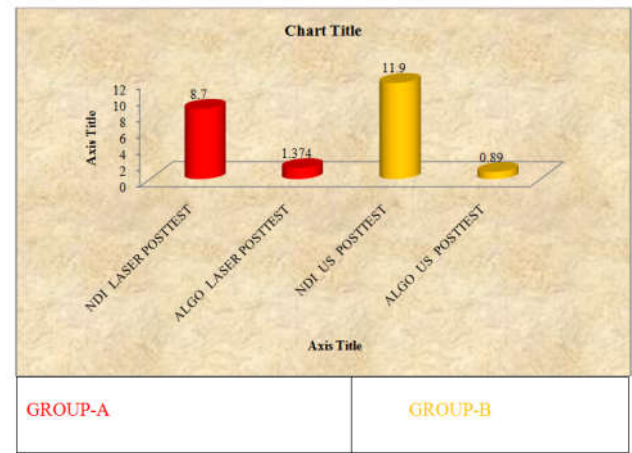
Table 2 Pre-test and Post-test mean values of pain measured by Algometer and neck disability measured with Neck Disability index questionnaire among Group B Chronic Tension Headache patients treated with Ultrasound therapy (N=20) for a period of four weeks.

Ultrasound Group-b		Mean	N	Sd	Paired 't' test	P value
Ndi questionnaire	Pre- test	26.40	10	4.351	21.615	0.000
	Post- test	11.90	10	2.514	21.615	
Algometer	Pre- test	0.530	10	0.149	-10.590	0.000
	Post- test	0.890	10	0.237	-10.590	

P<0.05

According to Table 1, the pre-test mean value of Neck disability index questionnaire score is 26.40 and the post-test mean value is 11.90, which shows significant changes in Neck disability index questionnaire score with Ultrasound Therapy treatment.

Pre-test mean value of Algometer is 0.530 and the post-test mean value is 0.890, which explains there is a significant reduction in pain with Ultrasound Therapy on chronic tension headache with P value of 0.000.(p<0.05).



Graph 3 Comparison of post-test values of Neck Disability Index questionnaire and Algometer between Group-A treated by Low-Level Laser Therapy along with conventional physiotherapy exercises and Group-B treated by Ultrasound therapy along with conventional physiotherapy exercises.

DISCUSSION

This study involves 20 subjects with Chronic Tension Headache who were divided into two groups. Group-A and Group-B with 10 subjects in each group. Subject in Group-A was treated with Low-Level Laser Therapy and subjects in group-B was treated with Ultrasound therapy and both the groups received conventional exercises as a part of home exercise programme.

As already stated in the need of the study, that the presence of active trigger points and pain referred from the points in neck and upper back will contribute to the increased frequency of tension headache. We addressed 20 Chronic tension headache subjects who presented with bilateral headache for more than 6 months along with trigger points in the trapezius and suboccipitalis areas.

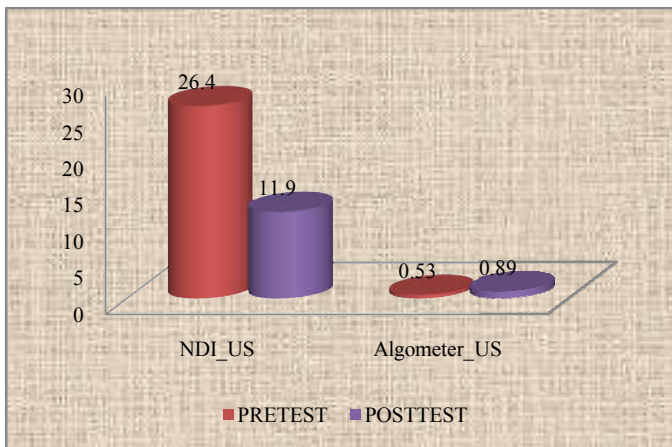
Among these 20 subjects around 8 subjects were presented with pain only in trapezius area whereas remaining 2 subjects had complaints of pain in suboccipital area than trapezius.

The pre and post measurements were conducted on both groups by using algometer by pain measurement and Neck Disability Index Questionnaire used to evaluate functional outcomes.

Group-A subjects treated with low level laser therapy shows a significant improvement in pain reduction and improvement in functional outcomes. (p<0.05)

Low level laser therapy has been widely used in the deactivation of myofascial trigger points when applied correctly. This goes in hand with Uemoto *et al*, 28 and authors who stated that low level laser therapy when applied to the region of myofascial trigger points it helps to improve the local microcirculation improves oxygen to the cell that in turn remove the waste product of cell metabolism by breaking the vicious cycle of pain-spasm-pain.

Laser therapy stimulates muscle trigger points on a non invasive basis providing musculoskeletal pain relief. Photons of light from LASER penetrate deeply into the tissues and accelerate cellular reproduction and growth. The laser light increases the energy available to the cell so that the cell can take on nutrients faster and get rid of waste products, as a



Graph 2 Pre-test and Post-test mean values of pain measured by Algometer and neck disability measured with Neck Disability Index questionnaire among Group B Chronic Tension Headache patients treated with Ultrasound therapy (N=20) for a period of four weeks.

Table 3 Comparison of post-test values of Neck Disability Index questionnaire and Algometer between Group-A treated by Low-Level Laser Therapy along with conventional physiotherapy exercises and Group-B treated by Ultrasound therapy along with conventional physiotherapy exercises.

	Post test	Mean	N	SD	Independent 't'-test	Ps Value
Ndi questionnaire	Group-A	8.70	10	2.627	-2.885	0.00
	Group-B	11.90	10	2.514	-2.885	
Algometer	Group-A	1.374	10	0.155	-2.858	0.00
	Group-B	0.890	10	0.237	-2.858	

P<0.05

According to Table 3, the Neck Disability Index questionnaire score post mean value of Group-A is 8.70 and for Group-B is 11.90, which shows Group-A have significant improvement in Neck Disability Index questionnaire score than Group-B.

result of exposure to Laser light ,the cells on tendons, ligaments and muscles repairs faster.

According to Simunovic *et al* 21, stated that the optimum dose applied correctly to the target area is more important as under- or over-irradiation may inhibit the effect. Physical therapy modality such as ultrasound and electric galvanic stimulation can sometimes be useful in managing trigger points.

It was reported that Ultrasound when applied to the area of trigger point causes increase in tissue temperature which association with vasodilatation and increase blood flow to the area provide analgesic effect over the trigger point nodules causing local muscle relaxation. Ultrasound increases the permeability of membranes which enhances transfer of fluids and nutrients to tissues. This is therapeutically useful for the sclerotic effects produced in the attempt of muscle spasm, increases the range of motion due to adherent tissues, and break up calcific depositions, mobilized adhesions, scar tissues. When Ultrasound travels through tissue a percentage of it is absorbed, and this leads to the generation of heat within that tissues. The amount of absorption depends upon the nature of the tissues, its degree of vascularisation.

Draper *et al*, reported that ultrasound therapy decrease the trigger point tenderness in the study which includes 44 patients who had active trigger points on right trapezius.

The post-test mean value of Neck Disability Index Score, Algometer score of group-A treated with Low-Level Laser Therapy (LLLT) was 8,70 and 11.90 and group B treated with Ultrasound (US) therapy was 1.374 and 0.890 at the end of 4 weeks simultaneously. Hence the recovery is faster, pain-free and effective in group-A subjects treated with Low-Level Laser Therapy. Thus, these statistical findings could be attributed to the fact that Low-Level Laser Therapy works more statistically than Ultrasound therapy.

CONCLUSION

The present study concluded that the application of four weeks treatment of Low-Level Laser Therapy (LLLT) and Ultrasound therapy (US) is both effective in decreased the pain and disability in subjects with chronic tension headache.

This study highlights that Low-Level Laser Therapy (LLLT) is highly significant ($p < 0.05$) than Ultrasound therapy in improving function in subjects with chronic tension headache.

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