ORIGINAL ARTICLE

Determine and compare the effects of Ultrasound Therapy versus Laser Therapy for the treatment of myofascial trigger points in the Upper Trapezius muscle

Syeda Amna Iqbal [1], Ayesha Arooj [2], Sara Noor [3], Qasim Raza[4], Farah Naz[5]

1. The Indus Hospital, Karachi
2. Combined Military Hospital, Multan
3. Umeed e seher multan
4. The Indus Hospital, Karachi
5. The Indus Hospital, Karachi

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Abstract

Background: Much of the population faces pain in the upper back due to myofascial trigger points and tight musculature within the higher trapezius muscle.

Objective: To determine and examine the consequences of therapeutic ultrasound vs. laser treatment for the healing of trigger points in the myofascial of the upper trapezius muscle.

Methodology: The quasi-experimental study was conducted at the University of Lahore teaching hospital from August 2020 to January 2021. Sixty patients' myofascial trigger points were incorporated into the study according to selection criteria has been equally assigned into groups. Group A was handled with therapeutic ultrasound and stretching exercise, while on the other hand, Group B was handled using therapeutic laser and stretching exercise. Pre-treatment and assessment of ache severity, functional disability, and range of motion of cervical region were done by Numeric- Pain rating Scale, Neck disability index, and goniometry, respectively.

Result: The mean pain reduction was found by 1.54±0.02 in the therapeutic ultrasound group and the therapeutic laser group by 1.2±0.2. Significant improvement was visible in ache, neck disability index, and neck range of movements among groups A and B measured by an independent pattern t-test.

Conclusion: This study concluded that ultrasound and therapeutic laser are equally effective for managing myofascial trigger points by increasing cervical lateral flexion and reducing neck disability index. However, on a clinical basis, ultrasound showed more promising results than laser.

Keywords: Laser therapy, Myofascial Trigger points, Trapezius, Ultrasonic therapy.

Introduction

Almost 85% of the general population is affected due to musculoskeletal pain; neck pain is the most common complaint.

***Corresponding Author: Dr. Ayesha Arooj (Combined Military Hospital, Multan)**
Email: ayeshaarooja1@gmail.com
Contact: 0335-6152012

According to a pilot survey in Pakistan, 27.7% of computer users have excruciating, radiating, or localized neck pain. Myofascial trigger points (MTrPs) is probably the fundamental root purpose of muscular neck ache and spasm. The trigger points are associated with many musculoskeletal problems and disorders[1].

One of the most commonly studied muscles over the whole body is the trapezius muscle. Myofascial ache is frequently visible in neck muscles, especially withinside the higher trapezius muscle (34.7%), which imparts ensuing in ache withinside the neck and shoulder region. A classic and usual trigger point may be defined as the presence of separate entity-focused tenderness in a palpable and easily located taut skeletal musclestriation, which emphasizes both local twitch muscle response and referred regional pain[2]. Trigger points are widespread in the office working due to overuse of trapezius muscle. Trigger points are hypersensitive areas or irritable spots on muscle fibers, which on palpation, are categorized as nodular structures[3]. Active myofascial trigger points (MTrPs) are fundamental ache turbines in myofascial ache syndrome[4].

The trapezius muscle is a large upper back muscle that superficially resembles a trapezoid structure. It extends from the occipital bone at its external protuberance to the decreased thoracic vertebral segments and laterally covers the scapula's backbone. The trapezius has three types: upper, middle, and lower fibers[5]. Myofascial ache is related to the presence of cause factors[6]. Trigger spots are tight bands of muscle tissue that become painful when compressed, contracted or stretched[7]. This condition is characterized by chronic neck and shoulder discomfort. When squeezed in the side, it frequently produces autonomic and referred motor phenomena, typically in its ache reference zone, and causes stiffness within the ache reference zone[2]. It is typically pliable, restricts the muscle from extending to its maximum range, causes muscle weakness, refers to a patient-identified ache on direct compression, mediates a nearby twitch reaction of muscle fibers when precisely activated, and mediates a nearby twitch reaction of muscle fibers when The Upper Trapezius Muscle (UTM) is 1 of the muscles most frequently affected by underlying causes[8].

Ultrasound is a physical modality used worldwide by a physical therapist to diagnose and treat musculoskeletal issues. It mainly controls inflammation in the injured area and promotes soft tissue injury healing[9]. Ultrasound is used for clinical and diagnostic assessment of trigger points[10]. The frequency of the ultrasound waves is typically not the depth of waves that is quite the opposite of how deep they penetrate the body(11). A 1MHz ultrasound device will go around 4 inches underneath the skin, while a 2MHz ultrasound device will only go around 2 inches.

On the other hand, by using a low-frequency ultrasound, one would get deeper penetration. Ultrasound has a dual frequency, i.e., 3MHZ for superficial penetration, including skin and mesoderm, and 1MHZ for deep penetration. Trigger points are assessed by palpation and then treated with ultrasound [12, 13].

Another significant factor for good results is an ultrasound's power output, a unit of measurement for watts per square centimeter. When power is high, much more energy will be transferred to the body[14]. If a power output that is too high is used and an ultrasound unit is unattended with the patient applied to the body, the possibility of burning the tissue beneath

the skin increases. To save time, practitioners sometimes use high-power equipment to speed up the treatment, which is hazardous. Before treatment, it is essential to inspect the purposes of stimulation rehabilitation on the interfacial region of the TM (15). It is safer to raise a low-power ultrasound for an extended period. For most injuries, ailments, pains, and discomforts, ultrasound therapy is typically delivered in 5–10-minute, for a duration of 2 to 3 times a day for the healing process[16].

A good session of therapeutic ultrasound treatments may consist of 3 to 10 minutes for 2 to 4 times a day. Ultrasound is a technique in which electrical energy is converted to sound waves to cater heat energy to muscles, proposed to treat myofascial pain[17]. It has side effects, too, so scientists and practitioners need to understand that high exposure to ultrasound can temporarily or permanently cause soft tissue damage [18].

On the other hand, Laser therapy is painless, accurate, and non-invasive and has too few side effects[19]. Lasers treat myofascial trigger points while releasing a cascade of healing mechanisms. The laser floods the damaged, inflamed tissue with photons. They energize the cells and promote increased blood flow and production of pain-reduction chemicals such as endorphins and enkephalins from the brain and adrenal gland[20]. For 30 seconds to several minutes, the laser is directly applied to the affected and painful area. The treatment period, on the other hand, is determined size region to be treated and the dosage administered. The layers of skin through non-thermal photons transmitted by Laser flow are the dermis, epidermis, and subcutaneous tissue or tissue fat underneath the skin. Trigger points are painful spots on compression that can be treated by non-invasive laser therapy with remarkable effects[21]. At 90nm and 830 nm, light can perforate 2 to 5 cm deep beneath the skin. As light energy enters the skin, it travels through the layers and reaches the target region. It is then absorbed, synergized, and interferes with the photo-sensitive segments in the cell. This process is comparable to photosynthesis in plants, in which the light energy elicited by the sun is absorbed and used by plants for survival.

As cells consume light energy, it causes a series of events to take place within the cell. It ultimately results in normalizing the varied or damaged tissue, pain management, edema, and inflammatory process, and overall reducing the healing time by increasing the rate of metabolism(intracellular)[22].

Dundar. Umit et al. showed placebo-controlled double-blinded research. The main goal of this research was to see whether ultrasound therapy could support the affected role of myofascial pain syndrome (MPS) in the cervical region. A population of 55 participants with cervical MPS was randomly divided into two main categories. Ultrasound therapy was applied over three trigger points, bilaterally, for 8-10 minutes once a day for 15 days tenure. It was implemented for three weeks in Group 1 with patients n=28. The placebo ultrasound was given to patients in Group 2 (n=27). Every patient in both groups has performed stretching and isometric therapeutic exercises for the cervical area daily. The subjective variables were taken initially, 4th and 12th weeks. The visual analogue scale (VAS), goniometer, and inclinometer were used for the analysis of ROM, pain, and disability, respectively, with the help of the Neck Disability Index

(NDI) scale and the Nottingham Health Profile (NHP) scale. Except for the sleep and social isolation subgroups of NHP, all outcome measures in both groups showed statistically significant changes in the 4th and 12th week. As a result of the findings of this research, ultrasound therapy is simple to use and successful in treating Myofascial Pain Syndrome in the cervical region. Laser therapy effectively reduces pain and pain threshold and improves the range of motion when combined with ischemic compression on the upper trapezius muscle[23].

Jung Hoon Lee (Aug,4,2011) was committed to measuring the dose-dependent effects of Laser therapy by employing laser on variat ions of pressure pain threshold (PPT) of m usculoskeletal trigger point (MTrP) of the upper trapezius muscle in seated employee s was compared to placebo laser. Laser therapy provides faster results in eliminating symptoms of trigger points and reducing the intensity of pain. It can be used for long-term treatment approaches[24]. The study was conducted on twenty-four subjects, of which ten males and 14 females were recruited. According to them, therapy with a placebo or an active laser was used in a double-blind, randomized method. The research involved people suffering from upper trapezius pain for more than six months and had a pressure pain threshold (PPT) of less than 3 kg. The pressure pain threshold was evaluated using algometry before applying and after using the low-level laser therapy (LLLT) in a relaxed seating position after 1, 2, and 5 minutes. Results have shown that the placebo group did not significantly change the pressure pain threshold. The experimental group did not show significant changes in PPT after 1min and 2mins laser therapy. However, significant changes resulted after 5 minutes of laser therapy. From the above results, it has been suggested that the higher the energy, the more its immediate effects would be that 1929J/m would be necessary to affect the pain pressure threshold while treating trigger points of the upper trapezius.

Priya Kanan researched the management of upper trapezius trigger points and discovered the most critical and successful therapeutic device for injuries due to myofascial trigger points on July 15, 2012. The effects of ultrasound therapy, therapeutic optical maser, and ischemic density on chronic aching and neck spinal column ROM in patients with upper trapezoidal arthritis were contrasted in this study. The outcome of subjective pain was determined using the VAS scale for pain, the suggestive pain assessment with the "soft tissue patient role tenderness grading scale," successful neck lateral flexion with a column inch adhesive tape. Participants were categorized keen on three groups: one received a therapeutic ultrasound, another received a therapeutic laser, and the third provided ischemic compression. On the first and fifth days of treatment, assessments were conducted. The Chi-square test showed that the laser community outperformed the other two groups. Laser therapy tends to progress over time and was more successful than the other two groups, according to the mean difference in the scores change between the studies. It has now been documented that laser therapy can be used for trigger points effectively, thus reducing impairment caused by musculoskeletal disorders[25].

The myofascial trigger points are pretty common these days due to extreme workload. Hence, the methodology to treat these has always been interesting. Many studies have shown the effects of different modalities on trigger points individually. Laser therapy has a remarkable effect in treating trigger points. It reduces pain by decreasing the thickness of the taunt muscular area and improves impaired or restricted ROM due to trigger points [7, 15]. This study shows the effect of therapeutic laser treatment and ultrasound therapy before and after the treatment in patients' roles with gun trigger spots in the myofascial of the superior trapezius muscle.

Material & methods:

This quasi-experimental study was conducted at The University of Lahore teaching hospital from August 2020 to January 2021. After approval from the ethical review committee, the sample size of 60 patients was calculated using epi-tools. The sample was computed using a random sampling technique from both male and female patients ages ranging from 20 to 50 years with a mean age of 34±5 years, patients with trigger points in the upper trapezius muscles; diagnosed using Travell and Simons' criteria, which includes four to five primary and one minor criterion, at least for clinical diagnosis of myofascial trigger points. The exclusion criteria include the history of recent fracture, surgery or open wounds in the neck region, cervical radiculopathy or myelopathy, skin diseases and lesions in the area of the trapezius muscle, cardiovascular patients fitted with pacemakers, fibromyalgia, and any psychosocial disorder.

All the subjects were recruited for the study after voluntarily fulfilling the consent form. Sixty patients were equally assigned into two groups, thirty (30) subjects in each group using the even and odd randomization method. Both groups were receiving stretching exercises of the upper trapezius as standard therapy. Group A received a therapeutic ultrasound, and Group B received a therapeutic laser, one treatment session per day for two weeks. Outcomes were reviewed after two weeks of treatment in terms of differences in scores on NPRS, goniometer readings, and NDI scores. The total numbers of sessions were 10. Each treatment session was of half an hour, 05 days per week—no other treatments like pain killers, physical agents, etc., were used during treatment.

The subjective pain assessment was evaluated using a Numerical Pain Rating Scale (NPRS)**, an** 11-point numeric scale (NPRS) frequently used to measure pain intensity. Lateral bending of the cervical spine using a goniometer assessed daily living activities using the Neck disability index.

First, we assessed the patient; all parameters were checked before treatment, palpated the trigger points, and marked. In Group A (ultrasound group), we applied the ultrasound (1MHZ, 1w/cm2) over each trigger point in a circular manner for 5mins. For group B (laser group), Gas laser, 650nm, and 20m were used. A single diode probe delivered a dose of 1joule per point for 3min at continuous mode over the area. Stretching was a standard therapy for both groups. Patients also performed stretching at home.

The results were generated by SPSS analysis using the 21 SPSS version. The results are expressed as mean ± standard

deviation (S.D.) for the quantitative data type. Total patients were evaluated to determine therapeutic ultrasound and laser's pre and post-treatment effects on myofascial trigger points. A paired sample t-test was performed to examine the pre-treatment and post-treatment group mean differences. A t-test was performed to examine the differences in mean values between the two treatments. P-values of 0.05 were regarded as significant.

Results

The outcomes presented that there were 13 males and 47 females as patients. The overall mean value for the age of study subjects was 37.18±7.828 years. Pre- and post-treatment NPRS was evaluated in both groups. T**able I** shows the descriptive statistics for pre-treatment of both ultrasound and laser group**s. Table II** shows the descriptive statistics for the post-treatment parameters of both groups.

The significance of treatment was determined by using a paired sample t-test to equivalence the mean before and after ultrasound and laser treatment, a p-value of 0.05 being considered significant. The mean difference between pre-and post-treatment was necessary, as shown in **Table III**, with a p-value of 0.01.

Table I: Descriptive statistics for pre-treatment

Parameters	Ultrasound group (Mean±S.D)	Laser Group (Mean±S.D)
Pain Intensity	3.53 ± 0.629	3.50 ± 0.630
Right side bending	28.00 ± 5.509	26.9 ± 7.37
Left side bending	30.9 ± 4.85	30.40 ± 6.484
NDI	3.33 ± 0.711	3.07 ± 1.015

Table II: Descriptive statistics for post-treatment parameters of both groups

Parameters	Ultrasound group (Mean±S.D)	Laser Group (Mean±S.D)
Pain intensity	1.99± 0.64	2.30±0.837
Right Side bending	35.23±4.89	34.53±6.213
Left side bending	38.70±3.68	36.33±4.859
NDI	2.03±0.615	2.17±0.642

Table III: Mean difference in pre and post treatment parameters of both groups

Groups	Parameters	Mean	S.D.	p-value
Ultrasound Group	Pain intensity	1.54	0.02	0.00
	Right side bending	7.33	0.7	0.00
	Left side bending	7.8	1.17	0.00
	NDI	**11.27**	**4.04**	**0.01**
Laser Group	Pain intensity	1.2	0.2	0.00
	Right side bending	7.63	1.16	0.00
	Left side bending	5.93	1.62	0.00
	NDI	**6.47**	**2.48**	**0.01**

Discussion

This cross-sectional research includes a descriptive case series of 112 university students from Pakistan. Researchers in the past looked at the physical activity and quality of life (QoL) of students at the college of health sciences and in different departments to see if physical activity improved QoL. [16]

In the current study, out of four domains of quality of life (Physical and social relations are significant Association as the p-value <0.05 while psychological health and the environment were not significantly associated as the p-value>0.05) were observed in each participant with the reference of physical activity level. Gender-associated physical activity level was also noticed. However, they found that students in the athletics department seemed more proactive than in other disciplines and significantly improved their QoL metrics.

Comparisons were found to show a significant association between QoL and physical activity among university students (p-value<0.001). Thus, physical exercise is shown to be related to the quality of life. Guner Cicek's similar study among Turkish university students indicated that physical exercise and quality of life have a good link. Turkish study evaluated all the domains of quality of life, and physical activity showed favourable links. However, our study Association between HR-QoL and physical activity level confirmed that physical Health and social Relationship are significant. However, environment and psychological health are not significant.

Another research by Jaroslav Bro Tamilani examines the correlations between physical exercise and adolescents' quality of life.[17] It determined that very low or significantly higher levels of physical activity per week influenced the individual aspects of the QoL of students in mid- to senior adolescence. Regular physical activity benefits life's reliability, even in small amounts. SQUALA was employed in this study to measure the participants' quality of life. However, WHOQL utilized this study to evaluate the quality of life and found the difference between males' and females' physical activity levels. That was more females who participated in Low and Moderate physical activities and, on the other hand, males with High physical activity levels.

According to research, grandparents, parents, and students all engaged in comparable amounts of physical activity and health-related behaviours. The number of people who are physically active now and, in the past, has decreased with age. Compared to their parent's and grandparents' generations, the students reported participating in physical activity more frequently in the past and the present. There was only a trend in the number of people who reported receiving rehabilitation therapy in the past and present and visiting sanatoriums.[18]

The students participating in the study had a significantly lower quality of life in the environmental and emotional domains compared to the students living in the home. Brown et al. (2003) reported this discovery, and Tekkanat's (2008) investigation corroborated it. The quality of life in all areas was substantially better among the other students than those residing in the dormitories. According to this result, students who stay at home have a more outstanding quality of life. It is possible that the students who stay in the

dorms are less satisfied than those who live there; thus, it is essential to look at the dorm's circumstances.[19]

It was discovered among university students that the QoL also rose with the growth in physical activity values, and there was a positive link. The gender and PA levels show that more females participated in Low and Moderate physical activities and, on the other hand, males with High physical activity levels. Physical exercise has been shown to have a significant effect on the physical health of university students. Students from every department should be encouraged to play any sport they want in their free time to get more exercise.

Conclusion

Physical well-being and social relationships are crucial, while environmental and psychosocial factors are not. The Association between activity level and healthcare quality of life has been verified.

Author Contributions
Conception and design: ***Syeda Amna Iqbal***
Collection and assembly of data: *Amna Sharif, Areeba Mansoor*
Analysis and interpretation of the data: *Ayesha Arooj*
Drafting of the article: *Sara Noor*
Critical revision of article for intellectual content: *Ayesha Arooj*
Statistical expertise: *Qasim Raza*
Final approval and guarantor of the article: *Farah Naz*
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References

1. Moraska AF, Schmiege SJ, Mann JD, Burtyn N, Krutsch JP. Responsiveness of myofascial trigger points to single and multiple trigger point release massages–a randomized, placebo-controlled trial. American journal of physical medicine & rehabilitation. 2017;96(9):639.
2. Fernández-de-Las-Peñas C, Dommerholt J. International consensus on diagnostic criteria and clinical considerations of myofascial trigger points: a Delphi study. Pain Medicine. 2018;19(1):142-50.
3. Money S. Pathophysiology of trigger points in the myofascial pain syndrome. Journal of pain & palliative care pharmacotherapy. 2017;31(2):158-9.
4. Abbaszadeh-Amirdehi M, Ansari NN, Naghdi S, Olyaei G, Nourbakhsh MR. Therapeutic effects of dry needling in patients with upper trapezius myofascial trigger points. Acupuncture in Medicine. 2017;35(2):85-92.
5. Nyemb P, Fontaine C, Ndoye J. Review of the literature on anatomical variations of the trapezius muscle. MOJ Anat Physiol. 2017;4(5):385-90.
6. Kumbhare DA, Elzibak AH, Noseworthy MD. Assessment of myofascial trigger points using ultrasound. American journal of physical medicine & rehabilitation. 2016;95(1):72-80.
7. Mustafa MS, Saleh MMS. Low-level laser versus ultrasound on myofascial trigger points of plantar fasciitis. International Journal of Therapies and Rehabilitation Research. 2017;6(5):25-32.
8. Rezaei S, Shadmehr A, Tajali SB, Moghadam BA, Jalali S. The effect of laser therapy and ischemic compression on active trigger points in the upper trapezius muscle. Journal of Modern Rehabilitation. 2019;13(4):221-6.
9. Papadopoulos ES, Mani R. The role of ultrasound therapy in managing musculoskeletal soft tissue pain. The international journal of lower extremity wounds. 2020;19(4):350-8.
10. Mazza DF, Boutin RD, Chaudhari AJ. Assessment of myofascial trigger points via imaging: A systematic review. American Journal of Physical Medicine & Rehabilitation. 2021;100(10):1003-14.
11. Elhafez HM, Ali IA, Embaby EA, Karkousha RN. Effect of Different Intensities of Ultrasound on Pain and Myoelectric Activities of Upper Trapezius Myofascial Trigger Points. Indian Journal of Public Health. 2020;11(04):1093.
12. Barbero M, Schneebeli A, Koetsier E, Maino P. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Current opinion in supportive and palliative care. 2019;13(3):270-6.
13. Yildirim MA, Kadriye Ö, Gökşenoğlu G. Effectiveness of ultrasound therapy on myofascial pain syndrome of the upper trapezius: a randomized, single-blind, placebo-controlled study. Archives of rheumatology. 2018;33(4):418-23.
14. Rigby JH, Draper DO. Effects of Long Duration Low-Intensity Ultrasound for Active Trapezius Trigger Points: A Randomized Clinical Trial. Journal of Sport Rehabilitation. 2017:1-17.
15. Seifolahi A, Rezaeian T, Mosallanezhad Z, Naimi SS. Comparison of Dry Needling and Low-Level Laser Effects on the Latent Trigger

Points of Upper Trapezius. Iranian Red Crescent Medical Journal. 2021;23(2).
16. Manca A, Limonta E, Pilurzi G, Ginatempo F, De Natale ER, Mercante B, et al. Ultrasound and Laser as Stand-Alone Therapies for Myofascial Trigger Points: A Randomized, Double-Blind, Placebo-Controlled Study. Physiotherapy Research International. 2014;19(3):166-75.
17. Desai MJ, Saini V, Saini S. Myofascial pain syndrome: a treatment review. Pain and therapy. 2013;2(1):21-36.
18. Izadifar Z, Babyn P, Chapman D. Mechanical and biological effects of ultrasound: A review of present knowledge. Ultrasound in medicine & biology. 2017;43(6):1085-104.
19. Kannan P. Management of myofascial pain of upper trapezius: a three-group comparison study. Global journal of health science. 2012;4(5):46.
20. Nazari A, Mozy A, Nejati P, Mazaherinezhad A. Efficacy of high-intensity laser therapy in comparison with conventional physiotherapy and exercise therapy on pain and function of patients with knee osteoarthritis: a randomized controlled trial with 12-week follow-up. Lasers in medical science. 2019;34(3):505-16.
21. Ahmed HM, Abu Taleb E, Ameen FH. High-intensity laser therapy on pain in patients with myofascial trigger points. Egyptian Journal of Physical Therapy. 2020;3(1):1-8.
22. Butzke A, Contro F, Gill G, Schmidt D, Seiler S. The effects of laser therapy and Graston technique on myofascial trigger points of the trapezius muscle. Logan College of Chiropractic. 2011.
23. Sut HK, Mestogullari E. Effect of premenstrual syndrome on work-related quality of life in Turkish nurses. Safety and health at work. 2016;7(1):78-82.
24. Taheri P, Vahdatpour B, Andalib S. Comparative study of shock wave therapy and Laser therapy effect in the elimination of symptoms among patients with myofascial pain syndrome in the upper trapezius. Advanced biomedical research. 2016;5.
25. David D, Giannini C, Chiarelli F, Mohn A. Text neck syndrome in children and adolescents. International journal of environmental research and public health. 2021;18(4):1565.
26. Gerdle B, Hilgenfeldt U, Larsson B, Kristiansen J, Søgaard K, Rosendal L. Bradykinin and kallidin levels in the trapezius muscle in patients with work-related trapezius myalgia, in patients with whiplash associated pain, and healthy controls–a microdialysis study of women. Pain. 2008;139(3):578-87.