Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.47750/jptcp.2023.30.15.054

Acupoint Focused Ultrasound Versus Laserpuncture in Chronic Mechanical Neck Pain

Rania Nagy Karkousha[1*], Dina Ahmed Ahmed Asar[2], Maher Ahmed ElKeblawy[3], Mohammed Abd-Elhalim Kadah[4]

[1]Assistant Professor of Physical Therapy, Basic Science Department, Faculty of Physical Therapy, Cairo University, Egypt.

[2]Demonstrator at Department of Basic Science, Faculty of Physical Therapy, October 6 University, Giza, Egypt.

[3]Professor of Physical Therapy for Basic Science Department, Faculty of Physical Therapy Cairo University, Egypt.

[4]Professor of Orthopedic surgery, Faculty of Medicine, Cairo University, Egypt.

***Corresponding author:** Rania Nagy Karkousha, Assistant Professor of Physical Therapy, Basic Science Department, Faculty of Physical Therapy, Cairo University, Egypt.

Submitted: 24 April 2023; Accepted: 16 May 2023; Published: 07 June 2023

ABSTRACT

Background: Mechanical neck pain typically develops gradually and has a variety of causes, including one or more of the following: neck strain, anxiety, bad posture, and activities related to job or sport. Purpose: The purpose of this research was to evaluate the efficacy of Acupoint focused ultrasound vs Laserpuncture in treating chronic mechanical neck pain, specifically in terms of pain intensity, range of motion, as well as neck function

Subjects and methods: The study comprised 45 individuals (aged 30 – 60) experiencing persistent mechanical neck pain, who were randomly split into three groups of equal size. Group (A) Experimental group got laserpuncture on top of traditional treatment, which entailed neck muscular stretching as well as strengthening Group (B) Experimental group got acupoint focused ultrasound along with traditional treatment and Group (C) Control group got traditional treatment only. All participants will receive treatment for 4 weeks, at a frequency of 3x/week. All patients were examined using a visual analogue scale, digital goniometer, as well as the Copenhagen Neck Function Disability Scale before and also after their rehabilitation programs.

Results: There was no substantial difference in Visual analogue scale, Copenhagen neck function disability scale as well as Neck range of motion among the three groups, pretreatment differences ($p > 0.05$). There was a substantial improvement in visual analogue scale as well as Copenhagen neck function disability scale of group A when contrasted to group B & C also substantial improvement in group B when contrasted to group C. There was a substantial improvement in neck flexion as well as neck extension range of motion of group A when contrasted to group C also a substantial improvement in neck extension range of motion as well as neck extension of group A when contrasted to group B. There was no substantial difference in right also left neck side bending as well as right and left neck rotation ROM among post-treatment groups ($p > 0.05$).

J Popul Ther Clin Pharmacol Vol 30(15):e475–e486; 07 June 2023.

Conclusion: In chronic mechanical neck pain, both laserpuncture and acupoint focused ultrasound are effective modalities for treating chronic mechanical neck pain respectively but Laserpuncture is more effective than acupoint focused ultrasound and conventional treatment in pain, function, neck extension range of motion and also is better than conventional treatment in neck flexion range of motion.

Key words: *Acupoint focused ultrasound, Laserpuncture, Mechanical neck pain*.

INTRODUCTION

Among the most common musculoskeletal complaints, neck pain can have far-reaching effects on an individual's life on multiple levels, including the physical, social, as well as psychological. Repetitive motion, work that requires lifting and carrying loads, and sedentary and slouched positions were found to be important risk factors for neck pain (1). Researchers have found that both psychological (such as stress and some cognitive aspects) and individual/biological (such as preexisting neuromuscular or autoimmune diseases, aging, as well as hereditary) factors contribute to the onset of neck pain (2).

Patients with chronic neck pain experience pain in their neck and shoulders, and in some cases tingling or radicular pain in their arms and hands. This condition typically lasts longer than six months. Nonspecific disorders of the neck / shoulder muscles, tendons, joints, as well as bones are thought to be at the root of persistent neck discomfort, which is in turn linked to as yet unknown degenerative changes (3)

Low-level laser therapy (LLLT) has gained popularity in recent years as a means of alleviating the pain associated with a variety of musculoskeletal conditions (4) Short-term and intermediate-term pain alleviation were significantly better after LLLT, and there was some evidence that LLLT reduced short-term disability, as shown by the Yousefi-Nooraie study (5) In some cases of nonspecific neck pain, laserpuncture (LP) could be an alternative for treatment. Specific acupuncture points will be laser-treated (6) 10 studies were presented by Gross et al. that favored the use of LLLT over a placebo for enhancing pain relief, functional recovery, as well as quality of life in individuals suffering from neck pain (7)

Ultrasound is a noninvasive method of delivering vibrational energy to soft tissues, it has found being used in therapeutic in addition to diagnostic imaging. Focused ultrasound was used to create a stimulation device for use in stimulating acupoints (8) Many clinical entities have reported positive outcomes after applying an ultrasound stimulus to such the acupuncture meridian system. As with conventional ultrasound therapy, a circular motion is used to apply the Sonicator head to the target area (9). The use of low-intensity ultrasound to treat chronic pain could save money for patients and healthcare system together (10)

Some studies compare the impact of laser vs ultrasound on supraspinatus tendinosis,(11) the impact of laser vs ultrasound on subacromial impingement,(12) and the impact of laser vs ultrasound on wound healing. (13) Because of this discrepancy, researchers have been left guessing as to whether acupoint focused ultrasound or laserpuncture is more effective for treating persistent mechanical neck pain.

SUBJECTS AND METHODS

The study was performed to compare the effects of Acupoint focused ultrasound vs Laserpuncture on pain level, ROM, as well as neck function in individuals with having chronic mechanical neck pain. All participants will be referred from orthopedist. Before they joined the study, all of the participants were given a consent form.

Design of the study

Randomized control clinical trial.

Subject selection

Patients aged 30 to 60 with a diagnosis of chronic mechanical neck pain met the inclusion criteria (14). They had a body mass index (BMI) of between 25 - 30 kg/m2) (15) All subjects referred from orthopedist. The musculoskeletal causes of the cervical pain were found to be benign (disc bulge -chronic muscle spasm ...). The neck pain

was persistent and recurrent, occurring at regular or sporadic intervals throughout the course of at least three months.

Exclusion criteria included: lack of a diagnosis or a diagnosis other than benign musculoskeletal cause for cervical pain, tension myositis syndrome**,** compression fractures due to osteoporosis**,** congenital deformity of spine**,** current acute pain syndrome**,** treatment for cancer within the past six months**,** Paracetamol, acetaminophen, non-steroidal anti-inflammatory medications (NSAIDs), compound analgesics, topical analgesics, also use of a muscle relaxant (cyclobenzaprine, diazepam, meprobamate) within the previous 30 days prior to study initiation were all excluded (6)

Grouping

Forty-five participants experiencing chronic mechanical neck pain were randomly assigned to one of three groups, each having 15 participants. Group A (Experimental group):15 patients got Laserpuncture and conventional treatment inform of stretching and strengthening for neck muscles three times every week for a total of four weeks. Group B (Experimental group):15 patients got Acupoint focused ultrasound and conventional treatment inform of stretching and strengthening for neck muscles three times every week for a total of four weeks Group C (Control group):15 patients got conventional treatment only inform of stretching and strengthening for neck muscles three times every week for a total of four weeks. All groups were treated three times every week for a total of four weeks. Every single patient was checked both before and after their treatment through visual analogue scale (VAS), digital goniometer, Copenhagen neck function disability scale (CNFDS). (9)

Assessment procedure

1-Visual Analogue Scale (VAS)

Pain in both its acute and chronic forms can be measured reliably and objectively using the visual analogue scale. Using a 10-centimeter line that ranges from "no pain" to "worst pain," patients record their pain levels on a visual scale. (16) Pain levels were measured using the VAS. The VAS was measured on a horizontal scale of 100 millimeters, with zero representing no pain and 100 being the most unbearable suffering imaginable (17)

Procedure

The patient was instructed to place a mark on the line corresponding to their level of pain. The degree of pain was represented by how far along the line from the left margin to the mark it was.

2-Digital Goniometer

The most widely used clinical instrument for evaluating joint range of motion is the digital goniometer, which provides the physiotherapist with a practical means of diagnosing musculoskeletal function in terms of ROM but also monitoring the efficacy of an intervention.(18) The digital goniometer has outstanding validity, intra-rater reliability, as well as inter-rater reliability (19) The digital goniometer will be employed as a valid and reliable ROM measuring tool; specifically, a digital absolute axis goniometer with an accuracy of roughly 0.99 will be used in the investigation (20).

Procedure

The patient was instructed to take a seat. The goniometer could be used with its single arm in a horizontal or vertical orientation. Later, the other arm was placed into proper alignment with the participant's body part. The digital goniometer showed an LCD screen with a reading of 0 to 180 degrees.

3-The Arabic version of Copenhagen Neck Functional Disability Scale

Patients with neck pain can have their level of disability assessed using the Copenhagen Neck Functional Disability Scale. The scores can be tracked over time to assess the development of the disease and the efficacy of treatment (21) Patients with persistent neck pain can now have their disability assessed with the help of an Arabic version of the CNFDS, which has been shown to have sufficient face and content validity, practicality, internal consistency, also test-retest reliability (22).

Procedure

The patient was asked to rate the level of impairment caused by neck pain. Then the points summed for all fifteen questions. Lowest score: 0. (21) Maximum score:30. (21). Higher scores indicate a more severe impairment (21)

Treatment Procedures

1-GymnaUniphy N.V VACCO 400 Laser (SN: 64726): small head (IEC 60825-1:2007)

Procedure

The laser "probe" head placed directly upon that acupuncture point, at right angles to the skin, and treatment of each point last 2 minutes for a total of 16 minutes (6)**.**

By using the following diameters:

TABLE 1: parameters of laser

Parameters	Value used
Technique	Infrared emitter diode, pulsed
Wavelength	905nm(red)
Duty cycle	50 %
Intensity	100 %
Laser frequency	5000Hz
Power density	12 mW/cm2
Dose (energy density)	2 J/cm2 at every point
Treatment time of each point	2min
Number of points	8 points
Total energy delivered	16 J/cm2
Total time	16 min
Application mode	A stationary probe is pressed against the patient's skin.
Laser beam diameter	12.9 mm2

2- Uniphy phyaction ub1m therapeutic ultrasound (SN:66666): small head (SN:527-0136)

Procedure

The conventional pulsing ratio for an ultrasonic beam was 1:5. The treatment head held perpendicular to the skin to ensure a direct and efficient transfer of energy. Ultrasound with a pulse intensity of 1 w/cm2 was applied in a stationary setting. Two minutes were spent on each acupuncture point before moving on to the next point on the same side, and then to the opposite side for no more than ten points before turning the machine off (23)

TABLE 2: parameters of ultrasound

Parameters	**Value used**
Frequency	1MHz
Intensity	1 w/cm2
Mode	Pulsed 1:5
Head diameter	Small 1.1cm

TABLE 3: Acupoints Location for neck disorders (24)

Jianjing (GB-21)	Midway between the acromial end of the clavicle and Dazhui (DU-14) on the shoulder, immediately above the nipple.
Jianzhonghu (SI-15)	Located 2 cun laterally of the spinous process's lower border on the 7th cervical vertebra.
Wangu (GB-12)	Localized in the head, in the notch below and behind the mastoid process.
Fengchi (GB-20)	Located in the depression formed by the top section of the trapezius as well as the sternocleidomastoid muscles at the base of the skull, just below the occipital bone and on a plane with Fengfu (DU-16).
Tianzhu (BL-10)	Located in the depression formed by the top section of the trapezius as well as the sternocleidomastoid muscles at the base of the skull, just below the occipital bone and on a plane with Fengfu (DU-16).

Dazhui (DU-14)	In the notch underneath the spinous process of the 7th cervical vertebra, on the posterior median line.
Dazhu (BL-11)	Located 1.5 cun laterally from the bottom border of the first thoracic vertebra's spinous process on the back.
Jianwaishu (SI-14)	On the back, Three cun laterally of the first thoracic vertebra's lower spinous process

Conventional treatment

Nevertheless, active neck strengthening as well as stretching exercises have not only reduced pain, but also enhanced neck function. In the present investigation, both manual therapy as well as stretching were found to be equally beneficial in reducing neck pain (25)

Procedure

Selective neck stretching ex for (flexor, extensor, side bending, rotator):26)

All of the exercises were performed while seate d or lying flat. The patient felt a stretch beyond what they could handle in terms of pain. Then each stretch maintained for 15-30 seconds to reach to the optimal stretch and then repeat multiple times.

Neck flexor stretch

Hand placement: One hand placed just at person's head base while the other hand on the top of the head, with fingers rested on forehead. To begin, the head positioned so that faced forward, the head was gently pushed back so that faced upward. Then the position maintained for 15-30 seconds.

Neck Extensor Stretch

The suboccipital as well as long extensor muscles were targeted in this particular stretch: the patient was looking straight ahead on chair. Then, patient chin gently pushed back while patient was looking straight ahead. While holding the patient chin back with one hand, with other hand gently pulled the top of head forward. This motion is a slight tilt. To avoid stressing the discs in your neck, it was important that you not to force this stretch and instead gently focus on lengthening the muscles as well as other soft tissues in the back of your neck.

Neck side bending muscle stretch

Hand placement: One hand placed at top of the person's shoulder while the other hand at the side of their head, near the top. To begin, the head positioned so that faced forward. The last position was stretch to the right by softly pressing on the hand on the shoulder then gently pushing with the top hand. After that, held a 15-30 second stretch. To the left, the same stretch was performed.

Neck Rotator Stretch

Scalene Muscles

To stretch the right side of scalene: for Anterior Scalene: one hand placed on top of patient head, then tilted head back and to the left as the right side of neck up towards the ceiling. The middle scalene patient instructed to maintain an upright posture. Then, a hand placed on the top of patient head on the right side and slid it over so that left ear was pointing toward left shoulder. The patient instructed to sit up straight in preparation for posterior scalene. Then, as the patient sniffed left armpit, one hand placed over the top of patient head on the right side and gently pulled the head down. Then, to stretch the left side of the neck, these same three movements was repeated.

Sternocleidomastoid

Patients instructed to sit up straight with back straight and chest up. One hand rested on the patient's chin while the other on the top of their head. The head rotated to one side and side flex neck to the other side. Then the head extended back while side flexion and rotation were maintaining. this position held for 15-30 sec.

Selective neck strengthening ex for (flexion, extension, side bending, lateral rotation):26)

The patient seated on a chair; feet rested comfortably on the floor. The patient was instructed to maintain head still and shoulders relaxed. Palm of one hand pressed against forehead of patient to resist neck flexion, this position held for 15 seconds. Relax. Then exercise repeated 5 times. The exercise repeated again, one hand pressed on the back of patient head to resist neck extension. Then this position

held for 15 seconds. Relax. then exercise repeated 5 times.

Then the exercise repeated again, one hand pressed on the side of patient head to resist neck side bending. This exercise held for 15 seconds. Relax. then exercise repeated 5 times. Then the exercise switched to the other side. Then the exercise repeated again, one hand pressed on the side of patient head & chin to resist patient neck rotation. Then exercise held for 15 seconds. Relax. then exercise repeated 5 times. Then the exercise switched to the other side.

Statistical procedures

The Shapiro-Wilk test was used to make sure the data were normally distributed before analysis. The homogeneity of the groups was tested using Levene's test for homogeneity of variances. There's been homogeneity of variance as well as a normal distribution of data. In order to compare subject characteristics across groups, an ANOVA was performed. Chi-squared test to analyse the difference in gender ratios between groups. Mean values of VAS, CNFDS, and neck ROM were compared before and after treatment, between groups, and with the interaction of time and treatment using mixed-MANOVA.

For further multiple comparison, post-hoc tests with the Bonferroni correction were performed. All statistical tests were performed at the < 0.05 level of significance. The Windows version of the statistical package for the social sciences (SPSS) was used for the analysis.

RESULTS

Subject characteristics

Table (4) revealed the differences between Groups A, B, and C in terms of subject characteristics. No statistically substantial differences were seen in the distribution of age, weight, height, BMI, or sex between groups (p > 0.05).

TABLE 4: Demographic data of participants.

	Group A	**Group B**	**Group C**	**p-value**
Age, mean ± (SD), years	45.33 ± 9.41	43.66 ± 9.25	44.13 ± 7.29	0.86
Weight, mean ± (SD), years	82.13 ± 5.56	81.40 ± 7.29	81.33 ± 7.97	0.94
Height, mean ± (SD), years	161.93 ± 6.88	164.33 ± 8.81	165.40 ± 9.88	0.53
BMI, mean ± (SD), kg/m²	31.51 ± 3.77	30.23 ± 2.91	29.76 ± 2.11	0.27
Sex, n (%)				
Females	10 (67%)	8 (53%)	11 (73%)	0.51
Males	5 (33%)	7 (47%)	4 (27%)	

SD, standard deviation; p-value, level of significance

Effect of treatment on VAS, CNFDS and neck ROM

Mixed MANOVA showed that there was a substantial interaction of treatment also time (F = 3.46, p = 0.001, Partial Eta Squared = 0.44). There was a substantial main effect of time (F = 129.13, p = 0.001, Partial Eta Squared = 0.96). There was a substantial main effect of treatment (F = 1.81, p = 0.04, Partial Eta Squared = 0.29).

Within group comparison

There was a substantial decline in VAS as well as CNFDS in three groups after treatment contrasted to that before-treatment (p < 0.001). The percent of change of VAS as well as CNFDS in group A was 70.51 & 76.18% respectively and in group B was 53.21 & 52.17% whereas in group C was 31.18 & 38.18% respectively. (Table 5).

There was a substantial increase in neck ROM in the three groups after treatment contrasted to that before-treatment (p < 0.001). The percent of change of flexion, extension, right bending, left bending, right rotation as well as left rotation in group A was 20.94, 20.96, 21.47, 20.97, 21.08 and 20.02% respectively, and that in group B was 13.65, 11.97, 18, 17.1, 15.24 and 14.25% respectively whereas that in group C was 10.34, 10.74, 15.44, 17.27, 12.89 and 11.28% respectively. (Table 6).

Between group comparison

There was a substantial decline in VAS as well as CNFDS of A group contrasted to that of group A & group B ($p < 0.01$) and substantial decline in group B contrasted to that of group C ($p < 0.05$) (Table 5).

There was a substantial increase in flexion as well as extension ROM of group A contrasted to that of group C ($p < 0.01$) and a substantial increase in extension ROM as well as extension of group A contrasted to that of group B ($p < 0.01$). There was no substantial difference in right & left bending as well as right & left rotation ROM between groups after treatment ($p > 0.05$). (Table 6).

TABLE 5: Mean for VAS and CNFDS pre and post treatment of group A, B and C

	Group A	**Group B**	**Group C**	**p-value**		
	mean ± SD	**mean ± SD**	**mean ± SD**	**A vs B**	**A vs C**	**B vs C**
VAS						
Pre treatment	78 ± 17.09	72.66 ± 16.67	82.33 ± 14.25	0.63	0.74	0.23
Post treatment	23 ± 7.97	34 ± 9.85	56.66 ± 9.38	0.005	0.001	0.001
MD (% of change)	55 (70.51%)	38.66 (53.21%)	25.67 (31.18%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			
CNFDS						
Pre treatment	19.86 ± 4.25	18.4 ± 5.43	18.86 ± 4.73	0.68	0.83	0.96
Post treatment	4.73 ± 2.08	8.8 ± 2.7	11.66 ± 3.69	0.001	0.001	0.02
MD (% of change)	15.13 (76.18%)	9.6 (52.17%)	7.2 (38.18%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			

SD, Standard deviation; p-value, Level of significance

TABLE 6: Mean for neck ROM pre and post treatment of group A, B and C

ROM (degrees)	**Group A**	**Group B**	**Group C**	**p-value**		
	mean ± SD	**mean ± SD**	**mean ± SD**	**A vs B**	**A vs C**	**B vs C**
Flexion						
Pre treatment	66.20 ± 7.56	67.4 ± 4.82	67.13 ± 6.07	0.85	0.91	0.99
Post treatment	80.06 ± 6.01	76.6 ± 4.92	74.07 ± 5.73	0.21	0.01	0.43
MD (% of change)	-13.86 (20.94%)	-9.2 (13.65%)	-6.94 (10.34%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			
Extension						
Pre treatment	58.53 ± 5.73	59.06 ± 4.51	58.93 ± 5.13	0.95	0.97	0.99
Post treatment	70.8 ± 4.29	66.13 ± 3.81	65.26 ± 5.22	0.01	0.004	0.85
MD (% of change)	-12.27 (20.96%)	-7.07 (11.97%)	-6.33 (10.74%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			
Right bending						
Pre treatment	32.6 ± 3.37	33.73 ± 6.17	34.13 ± 4.40	0.79	0.65	0.97
Post treatment	39.6 ± 2.53	39.80 ± 3.29	39.4 ± 3.69	0.98	0.98	0.93
MD (% of change)	-7 (21.47%)	-6.07 (18%)	-5.27 (15.44%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			

Left bending						
Pre treatment	34 ± 3.18	34.67 ± 4.30	34.33 ± 3.45	0.87	0.96	0.96
Post treatment	41.13 ± 1.64	40.60 ± 3.29	40.26 ± 2.65	0.84	0.64	0.93
MD (% of change)	-7.13 (20.97%)	-5.93 (17.1%)	-5.93 (17.27%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			
Right rotation						
Pre treatment	60.67 ± 5.22	63 ± 4.35	63.6 ± 8.07	0.55	0.39	0.96
Post treatment	73.46 ± 6.34	72.6 ± 5.65	71.8 ± 6.62	0.92	0.74	0.93
MD (% of change)	-12.79 (21.08%)	-9.6 (15.24%)	-8.2 (12.89%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			
Left rotation						
Pre treatment	62.93 ± 6.16	64.07 ± 5.31	64.46 ± 7.03	0.87	0.77	0.98
Post treatment	75.53 ± 6.72	73.2 ± 4.52	71.73 ± 6.87	0.55	0.22	0.79
MD (% of change)	-12.6 (20.02%)	-9.13 (14.25%)	-7.27 (11.28%)			
	p = 0.001	***p = 0.001***	***p = 0.001***			

SD, Standard deviation; p-value, Level of significance

DISCUSSION

The purpose of this research was to evaluate the efficacy of Acupoint focused ultrasound vs Laserpuncture in treating chronic mechanical neck pain, specifically in terms of pain severity, ROM, as well as neck function. The current investigation lasted from October 16, 2022, to April 16, 2023.

The present study was performed on forty-five patients, they were assigned randomly in 3 groups of equal number using blocked randomization.The first group (A) received laserpuncture and conventional physiotherapy inform of stretching and strengthening stretching for neck muscles, the second group (B) received acupoint focused ultrasound and conventional physiotherapy and the third group (C) received conventional physiotherapy only. Evaluation of all groups was done through visual analogue scale, digital goniometer as well as Copenhagen neck function disability scale.

TABLE 7: Findings

Hypothesis		**Statistical test used**	**Accept or reject**	**Types of error**
1-No statistically substantial difference between the impact of Acupoint focused ultrasound as well as laserpuncture upon pain intensity level		Mixed MANOVA	Reject	Type I error
2-No statistically substantial difference between the impact of Acupoint focused ultrasound as well as laserpuncture upon neck ROM	a-Flexion	Mixed MANOVA	Accept	Type II error
	b-Extension		Reject	Type I error
	c-Right side bending		Accept	Type II error
	d-Left side bending		Accept	Type II error
	e-Right rotation		Accept	Type II error
	f-Left rotation		accept	Type II error

3-No statistically substantial difference between the impact of Acupoint focused ultrasound as well as laserpuncture upon neck function	Mixed MANOVA	Reject	Type I error

The results of this study revealed that there was a substantial decline in VAS as well as CNFDS of A group contrasted to that of group B & group C also substantial decline in group B contrasted to that of group C. there was a substantial increase in neck flexion as well as neck extension ROM of group A contrasted to that of group C and a substantial increase in neck extension ROM as well as neck extension of group A contrasted to that of group B. There was no substantial difference in right & left neck side bending as well as right & left neck rotation ROM between groups after treatment ($p > 0.05$).

The result of the present research was supported by other researches in the literature. The followings will display the supporting studies.

Regarding pain

a-Effectiveness of laserpuncture was supported by studies of: Graham et al (2013) stated, "The present state of the evidence recommends acupuncture, laser therapy, as well as intermittent traction for chronic neck pain.27) Gross et al (2013) discovered that LLLT may help alleviate chronic neck pain.5) Rubira et al (2019) stated that the three modalities (low-level laser, pulsed ultrasound, continuous ultrasound) have substantial impact in alleviating low back pain in women experiencing chronic non-specific pain, although the pulsed low-level laser was the most effective.28)

Mohamed A. Awad, et al (2018) discovered that both ultrasound as well as low-level laser therapy are helpful methods of relieving low back pain after giving birth, as there were substantial differences in pain intensity. LLLT is more effective than ultrasound at reducing pain.29) Jothi Prasanna K., and Nandhini N (2019) LLLT also US both reduced pain in participants experiencing chronic tension headache after four weeks of treatment.30)

Djavid et al (2007) found that LLLT appeared to be more helpful than exercise alone in reducing pain associated with chronic low back pain. laser therapy is an adjuvant intervention and it should be applied with appropriate exercises.31) Chow et al (2009) determined that "show that LLLT reduces pain immediately after treatment in acute neck pain and up to 22 weeks after completion of treatment in patients with chronic neck pain".32)

Huang et al (2015) study offered the most convincing evidence for the efficacy of LLLT in the management of NSCLBP to date. This data supports the use of LLLT for the treatment of NSCLBP-related low back pain.4) Yılmaz M et al (2022) Researchers found that combining laser therapy with exercise improved pain reduction and isokinetic measures of muscle strength.33)

There are studies that proved the effectiveness of acupoint focused ultrasound:

Celik O et al (2013) Therapeutic uses of US have been shown to be useful in reducing pain as well as sensitivity at painful points on the cervical spine. It has a beneficial effect on functional status as well.34) W. Qing et al (2021) determined that therapeutic ultrasound is a safe treatment with the potential to lessen pain more than a placebo or no treatment.35) Petterson et al (2020) demonstrated that Low-intensity US treatment substantially lessen pain in patients having upper trapezius myofascial pain of the neck as well as shoulder.10)

Regarding function

Gross et al (2013) revealed that LLLT may be beneficial for neck function.5) Rubira et al (2019) showed substantial effects of LLLLT as well as pulsed US on reducing functional impairment in women experiencing NSCLBP.28) Djavid et al (2007) found that LLLT, when used in conjunction with exercise for chronic low back pain, was more beneficial than exercise alone in lowering disability. As an adjunctive treatment, laser therapy is most effective when combined with the right kinds of physical exercise. 32)

Jothi Prasanna K., and Nandhini N (2019) concluded that LLLT as well as US, when used for four weeks, both reduce impairment in those with persistent tension headaches. LLLT is extremely substantial ($p<0.05$) than US in improving function in individuals experiencing chronic tension headache.30) Kotteeswaran.k ET AL (2021) group A (laser therapy combined muscle energy technique) showed greater

functional improvement in participants with trapezitis compared to group B (US plus muscle energy technique).36)

Celik O et al (2013) reported that therapeutic ultrasound treatments decreased the pain threshold at cervical trigger points. In addition, it has a beneficial effect on functional status.34) Yılmaz M et al (2022) founded that combining laser therapy alongside exercise yielded the best results for improving function, quality of life, as well as isokinetically measured muscle strength. 33)

Regarding ROM

Mohamed A. Awad, et al (2018) exhibited substantial variations in flexion, extension, as well as lateral side bending ROM following treatment, indicating that both ultrasound as well as LLLT are efficient techniques for managing post-natal low back pain. When comparing LLLT with US for enhancing lumbar extension ROM, LLLT is superior.29) Yılmaz M et al (2022) Results showed that the combination of laser therapy and exercise was superior to either modality alone in enhancing ROM as well as isokinetically evaluated muscle strength.33) that therapeutic ultrasound is beneficial for reducing knee pain and

On the other hand, there were studies results that disagree to the current study results as following.

Regarding pain

Bier et al (2018) study concluded that "low level laser therapy has no effects in contrast to other treatments or placebo"."It is not recommended that clinicians use dry needling, low-level laser, electrotherapy, ultrasound, or traction for patients with neck pain."7) Noori et al (2019) cannot recommend using US on its own to treat long-term back or neck pain. It does look like US could be part of a physical therapy treatment plan that could help relieve pain in the short term.37) Rastgar Koutenaei F, et al (2017) noted that both active laser therapy in conjunction with regular physiotherapy and a placebo treatment with regular physiotherapy reduced knee pain, and there wasn't a substantial difference between the two.38)

Regarding function

Rubira et al (2019) stated that the three modalities (low-level laser, pulsed US, continuous US) have substantial impact to improving functional disability in women having NSCLBP, however, pulsed US was the most effective treatment for reducing functional impairment.28) Malik S et al (2023) found that the combination of LLLT and ET was no better in improving function in KOA than a placebo.39)

Regarding ROM

Mohamed A. Awad, et al (2018) exhibited substantial variations in flexion, extension, as well as lateral side bending ROM following treatment, indicating that both US as well as LLLT are effective modalities for relieving post-natal low back pain. LLLT is better than US in increasing lumbar flexion as well as lateral side bending ROM.29)

LIMITATIONS

All patients are motivated in their own unique ways. Due to various reasons, some patients did not finish the study's treatment procedure and were therefore excluded.

CONCLUSION

In chronic mechanical neck pain, both laserpuncture and acupoint focused ultrasound are effective modalities for treating chronic mechanical neck pain respectively but Laserpuncture is more effective than acupoint focused ultrasound and conventional treatment in pain, function, neck extension range of motion and also is better than conventional treatment in neck flexion range of motion.

REFERENCES

1. Genebra CVDS, Maciel NM, Bento TPF, Simeão SFAP, Vitta A. Prevalence and factors associated with neck pain: a population-based study. Braz J Phys Ther. 2017 Jul-Aug;21(4):274-280.
2. Kazeminasab S, Nejadghaderi SA, Amiri P, Pourfathi H, Araj-Khodaei M, Sullman MJM, Kolahi AA, Safiri S. Neck pain: global epidemiology, trends and risk factors. BMC Musculoskelet Disord. 2022 Jan 3;23(1):26.
3. Liang ZH, Di Z, Jiang S, Xu SJ, Zhu XP, Fu WB, Lu AP. The optimized acupuncture treatment for neck pain caused by cervical spondylosis: a study

protocol of a multicentre randomized controlled trial. Trials. 2012 Jul 9;13: 107.
4. Huang Z, Ma J, Chen J, Shen B, Pei F, Kraus VB. The effectiveness of low-level laser therapy for nonspecific chronic low back pain: a systematic review and meta-analysis. Arthritis Res Ther. 2015 Dec 15;17: 360
5. Gross AR, Dziengo S, Boers O, Goldsmith CH, Graham N, Lilge L, Burnie S, White R. Low Level Laser Therapy (LLLT) for Neck Pain: A Systematic Review and Meta-Regression. Open Orthop J. 2013 Sep 20;7: 396-419.
6. Peron R, Rampazo ÉP, Liebano RE. Traditional acupuncture and laser acupuncture in chronic nonspecific neck pain: study protocol for a randomized controlled trial. Trials. 2022 May 16;23(1):408.
7. Bier JD, Scholten-Peeters WGM, Staal JB, Pool J, van Tulder MW, Beekman E, Knoop J, Meerhoff G, Verhagen AP. Clinical Practice Guideline for Physical Therapy Assessment and Treatment in Patients with Nonspecific Neck Pain. Phys Ther. 2018 Mar 1;98(3):162-171.
8. Tsuruoka N, Watanabe M, Takayama S, Seki T, Matsunaga T, Haga Y. Brief effect of acupoint stimulation using focused ultrasound. J Altern Complement Med. 2013 May;19(5):416-9.
9. Rossman, Martin L.; Wexler, Jesse; Oyle, Irving (1974). The Use of Sonopuncture in Some Common Clinical Syndromes. The American Journal of Chinese Medicine, 2(2), 199–201.
10. Petterson S, Plancher K, Klyve D, Draper D, Ortiz R. Low-Intensity Continuous Ultrasound for the Symptomatic Treatment of Upper Shoulder and Neck Pain: A Randomized, Double-Blind Placebo-Controlled Clinical Trial. J Pain Res. 2020 Jun 2;13: 1277-1287.
11. Liz Saunders,Laser versus Ultrasound in the Treatment of Supraspinatus Tendinosis: Randomised controlled trial,Physiotherapy,Volume 89, Issue 6, 2003, Pages 365-373.
12. Yavuz F, Duman I, Taskaynatan MA, Tan AK. Low-level laser therapy versus ultrasound therapy in the treatment of subacromial impingement syndrome: a randomized clinical trial. J Back Musculoskelet Rehabil. 2014;27(3):315-20.
13. Demir H, Yaray S, Kirnap M, Yaray K. Comparison of the effects of laser and ultrasound treatments on experimental wound healing in rats. J Rehabil Res Dev. 2004 Sep;41(5):721-8.
14. Skillgate E, Magnusson C, Lundberg M, Hallqvist J. The age- and sex-specific occurrence of bothersome neck pain in the general population--results from the Stockholm public health cohort. BMC Musculoskelet Disord. 2012 Sep 24;13: 185.
15. Nilsen TI, Holtermann A, Mork PJ. Physical exercise, body mass index, and risk of chronic pain in the low back and neck/shoulders: longitudinal data from the Nord-Trondelag Health Study. Am J Epidemiol. 2011 Aug 1;174(3):267-73.
16. Delgado DA, Lambert BS, Boutris N, McCulloch PC, Robbins AB, Moreno MR, Harris JD. Validation of Digital Visual Analog Scale Pain Scoring with a Traditional Paper-based Visual Analog Scale in Adults. J Am Acad Orthop Surg Glob Res Rev. 2018 Mar 23;2(3):088.
17. Aggarwal K, Lamba AK, Faraz F, Tandon S, Makker K. Comparison of anxiety and pain perceived with conventional and computerized local anesthesia delivery systems for different stages of anesthesia delivery in maxillary and mandibular nerve blocks. J Dent Anesth Pain Med. 2018;18(6):367-373.
18. Yaikwawongs, N., Limpaphayom, N., & Wilairatana, V. Reliability of digital compass goniometer in knee joint range of motion measurement. Medical journal of the Medical Association of Thailand.2009 Apr; 92(4), 517-22.
19. Svensson, M., Lind, V., & Löfgren Harringe, M. Measurement of knee joint range of motion with a digital goniometer: A reliability study. Physiotherapy Research International.2019 Apr;24(2), e1765.
20. Correll S, Field J, Hutchinson H, Mickevicius G, Fitzsimmons A, Smoot B. Reliability And Validity Of The Halo Digital Goniometer For Shoulder Range Of Motion In Healthy Subjects. Int J Sports Phys Ther. 2018 Aug;13(4):707-714.
21. Jordan A Manniche C et al. The Copenhagen Functional Disability Scale: A study of reliability and validity. J Manipulative Physiological Therapeutics. 1998; 21: 520-527.
22. Elbeltagy AM, Sayed WHE, Allah SSR. Validity and Reliability of the Arabic Version of the Copenhagen Neck Functional Disability Scale in Neck Pain Patients. Asian Spine J. 2018 Oct;12(5):817-822.
23. Maher A E,Wafaa H. B, Fatma S, Omar T.The Use of Acupuncture, Laserpuncture and Sonopuncture in Treatment of Chronic Lumbar Myofascial Pain Syndrome,Bull.Fac. Ph. Th. Cairo Univ,:Vol 3. No (1) Jan. 1998,pp.93-100.
24. Sun M, Geng G, Chen J, Ma X, Yan M, Liu X, Du J, Cai D, Zheng H, Zhao L, Liang FR. Acupuncture for chronic neck pain with sensitive points: study protocol for a multicentre randomised controlled trial. BMJ Open. 2019 Jul 30;9(7):026904
25. Häkkinen A, Salo P, Tarvainen U, Wirén K, Ylinen J. Effect of manual therapy and stretching on neck muscle strength and mobility in chronic neck pain. J Rehabil Med. 2007 Sep;39(7):575-9.
26. illanueva-Ruiz I, Falla D, Lascurain-Aguirrebeña I. Effectiveness of Specific Neck Exercise for

Nonspecific Neck Pain; Usefulness of Strategies for Patient Selection and Tailored Exercise-A Systematic Review With Meta-Analysis. Phys Ther. 2022 Feb 1;102(2):259
27. Graham N, Gross AR, Carlesso LC, Santaguida PL, Macdermid JC, Walton D, Ho E; ICON. An ICON Overview on Physical Modalities for Neck Pain and Associated Disorders. Open Orthop J. 2013 Sep 20;7: 440-60
28. Rubira APFA, Rubira MC, Rubira LA, Comachio J, Magalhães MO, Marques AP. Comparison of the effects of low-level laser and pulsed and continuous ultrasound on pain and physical disability in chronic non-specific low back pain: a randomized controlled clinical trial. Adv Rheumatol. 2019 Dec 17;59(1):57.
29. Mohamed A.A, Asmaa M.A, Abd El-hamid A.A ,Mina N.S. Effect of Ultrasound Versus LowLevel Laser Therapy in Treatment of Postnatal Low Back Pain. Med. J. Cairo Univ., Vol. 86, No. 7, 2018 December: 4125-4135.
30. Jothi Prasanna K., and Nandhini N (2019) 'A Comparison of Low-Level Laser Therapy Versus Ultrasound Therapy in Trigger Point Release for Chronic Tension Headache', International Journal of Current Advanced Research, 08(03), pp. 17627-17632
31. Djavid GE, Mehrdad R, Ghasemi M, Hasan-Zadeh H, Sotoodeh-Manesh A, Pouryaghoub G. In chronic low back pain, low level laser therapy combined with exercise is more beneficial than exercise alone in the long term: a randomised trial. Aust J Physiother. 2007;53(3):155-60
32. Chow RT, Johnson MI, Lopes-Martins RA, Bjordal JM. Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. Lancet. 2009 Dec 5;374(9705):1897-908.
33. Yılmaz M, Eroglu S, Dundar U, Toktas H. The effectiveness of high-intensity laser therapy on pain, range of motion, functional capacity, quality of life, and muscle strength in subacromial impingement syndrome: a 3-month follow-up, double-blinded, randomized, placebo-controlled trial. Lasers Med Sci. 2022 Feb;37(1):241-250
34. Celik O, Ketenci A, Esmaeilzadeh S, *et al*.The effectiveness of therapeutic ultrasound in non-specific mechanical cervical pain and comparison of different application methods for clinical practice *Annals of the Rheumatic Diseases* 2013;72:A992.
35. Qing W, Shi X, Zhang Q, Peng L, He C, Wei Q. Effect of Therapeutic Ultrasound for Neck Pain: A Systematic Review and Meta-Analysis. Arch Phys Med Rehabil. 2021 Nov;102(11):2219-2230
36. K. Kotteeswaran, Syed Gaffar, Krishna. R, Keerthana Priya. R. Effectiveness of Laser Therapy and Ultrasound Therapy along with Muscle Energy Technique in subjects with Trapezitis. Asian Journal of Pharmacy and Technology. 2021; 11(2):116-0
37. Noori SA, Rasheed A, Aiyer R, Jung B, Bansal N, Chang KV, Ottestad E, Gulati A. Therapeutic Ultrasound for Pain Management in Chronic Low Back Pain and Chronic Neck Pain: A Systematic Review. Pain Med. 2020 Nov 7;21(7):1482-1493.
38. Rastgar Koutenaei F, Mosallanezhad Z, Naghikhani M, Ezati K, Biglarian A, Nouroozi M, et al. The Effect of Low Level Laser Therapy on Pain and Range of Motion of Patients With Knee Osteoarthritis. Physical Treatments. 2017; 7(1):13-28.
39. Malik S, Sharma S, Dutta N, Khurana D, Sharma RK, Sharma S. Effect of low-level laser therapy plus exercise therapy on pain, range of motion, muscle strength, and function in knee osteoarthritis - a systematic review and meta-analysis. Somatosens Mot Res. 2023 Mar;40(1):8-24.