Comparative Effectiveness of Court-Type Thai Traditional Massage and Ultrasound Therapy in Patients with Neck Pain: A Randomized Controlled Trial

Nuttapol Watcharasirikul, B.ATM.*, Manmas Vannabhum, B.ATM., Ph.D.*, Rungsima Yamthed M.Sc., Tanida Srikhlo B.Sc.**, Pravit Akarasereenont, M.D., Ph.D.*, Kamontip Harnphadungkit, M.D.****

**Center of Applied Thai Traditional Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700, Thailand, **Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700, Thailand.*

ABSTRACT

Objective: Neck pain is a common problem. *Lomplaipattakad Sanyan-4-Lang* (LPP-S4L) disease is a frequent cause of neck pain in Thai traditional medicine. Thai traditional medicine recommends treating neck pain with court-type Thai traditional massage (CTTM). Meanwhile, in conventional medicine, ultrasound modality (US) is used to treat neck discomfort. However, there is no scientific evidence if CTTM has potential analgesic advantages on LPP-S4L compared to ultrasound therapy. The study aims to evaluate the efficacy of CTTM compared to US and find body elements of participants based on aspects of Thai traditional medicine.

Materials and Methods: Sixty-six participants were diagnosed with LPP-S4L, with a numerical rating scale (NRS) ≥ 4. Patients were randomly assigned to one of two groups (33 per group). Participants underwent CTTM or US therapy eight times in total (twice a week). Pain intensity, pressure pain threshold, Range of motion (ROM), quality of life, and a body element questionnaire were used to assess patients.

Results: Both treatments showed a significant reduction in pain intensity, increase in pain threshold, increase in ROM, and improvement in quality of life in patients with LPP-S4L. The current study found that CTTM is more effective than US in most parameters, except Quality of life (QoL). Moreover, a decrease in pain intensity is related body elements, which indicates the influence of CTTM, or mostly the fire element.

Conclusion: We recommend employing CTTM, an alternative therapy, to treat patients with neck pain caused by LPP-S4L disease.

The trial was registered at thaiclinicaltrials.org (number: TCTR20211004008).

Keywords: Musculoskeletal pain; myofascial pain syndrome; Thai traditional medicine; massage; ultrasound therapy; body elements (Siriraj Med J 2023; 75: 29-37)

INTRODUCTION

Neck pain is a problem that affects both individuals and families, the healthcare system, and organizations.[1] The prevalence of neck pain in adults is significant, with the problem affecting up to 75% of the global population.[1,2] Neck pain is a type of discomfort that originates at the posterior of the neck and extends to the head, scapula, shoulder, trunk, and upper limbs.[3] Pain usually lasts more than three months and is commonly characterized by hyperalgesia in the skin, ligaments, and muscle palpations,

Corresponding author: Kamontip Harnphadungkit
E-mail: kamontip.har@gmail.com
Received 22 September 2022 Revised 27 October 2022 Accepted 4 December 2022
ORCID ID:http://orcid.org/0000-0003-3101-8804
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as well as a limitation of the range of motion (ROM) of the neck and shoulder joints.[4] A variety of risk factors are thought to play a role in the development of neck pain. These risk factors can be divided into three main categories: physical, psychosocial, and individual-related risk factors. Although physical risk factors for neck pain are generally emphasized, psychosocial risk factors appear to play a more important role in the development of neck pain. In fact, neck pain is associated with multiple psychological risk factors such as having a demanding job, poor social support, and low job security.[4] This can also affect the quality of life.[5] In Thailand, a study reported a significant prevalence of neck pain in both adults and teenagers, with the main causes being poor body posture and stress.[6]

Neck pain is also a prevalent condition in individuals with musculoskeletal pain, according to traditional medicine, especially Thai traditional medicine where the condition is known as *Lomplaipattakad Sanyan 4 Lang* (LPP-S4L) disease. *Lomplaipattakad* are diseases caused by a defect in the wind element in the body while *Sanyan 4 Lang* defines the location of disease. When combined, LPP-S4L is a muscular discomfort of the posterior neck region, with a painful spot and muscle tightness above the 7th cervical vertebra (C7). The discomfort might be perceived in the scapula region, the anterior chest wall, and the upper limbs. Therefore, the practitioner must carry out a physical examination to assess range of motion (ROM) of the neck and palpation.

LPP-S4L is also frequently associated with neck myofascial pain syndrome (MPS). The Thai traditional medicine practice guidelines for neck pain recommend massage, hot herbal compression[7], or combination treatment.[8] Thai massage, also known as *Nuad Thai* in Thailand, has various styles. It is classified based on characteristics and the goal of the massage. The court-type Thai traditional massage (CTTM) is typically used for therapeutic purposes, while the general type is used for relaxation.[9,10] CTTM focuses on rehabilitation and treatment of musculoskeletal complaints and disorders. Its technique relies on the application of pressure on muscles with thumbs or palms, with a goal to reduce muscular tension, joint stiffness, and pain.[9] The principal focus of CTTM is major signal points (MaSPs) since anatomical examinations of each MaSP have shown that the majority of points are linked to muscles connected to branches of arteries and nerves. The effectiveness of CTTM therapy is the result of effective massage of MaSPs.[11,12] Massage has proven to have an impact on the musculoskeletal system, nervous system, cardiovascular system, and the mind. Several previous CTTM studies have revealed that a massage results in a rise of skin temperature and blood flow rate, indicating that it targets both local and systemic circulation.[13] Meanwhile, other studies show that each CTTM massage session should last between 30 and 60 minutes to relieve neck pain.[14-20] CTTM reduces pain intensity in the upper trapezius MPS more than topical diclofenac.[14, 15] Furthermore, CTTM also reduces the pain score and improves pain threshold in patients with chronic myofascial pain syndrome. It has also been suggested that CTTM be used with *Ruesi dad ton* (hermit doing body contortion) exercise to increase neck and shoulder joint ROM.[16] Last but not least, CTTM alleviates discomfort and reduces the need for medication in chronic headaches.[17-20]

In conventional medicine, most MPS patients receive various therapies[21], including medicine, ultrasound[22], acupuncture[23], stretching exercises[24], and massage.[15,16,25] One of the most common therapies is ultrasound (US), which uses high frequency acoustic vibrations convert to heat at the tissue level.[26] The thermal and non-thermal effects of US increase muscle fiber, tendons, ligaments, and joint capsule flexibility, and in the process reduce pain intensity and joint stiffness.[27] In a previous clinical study, US was able to rapidly reduce trigger point stiffness in the upper trapezius muscle in the US treatment group.[22] One study found that combining US, massage, and exercise for treatment of myofascial pain was not differ from a sham-US group combining massage and exercise.[28] However, there is no scientific clinical trial data to demonstrate that CTTM has potential analgesic effects on LPP-S4L compared to US.

The aim of this study was to compare the efficacy of CTTM and US on pain reduction in patients with LPP-S4L by measuring pain intensity, neck ROM, pressure pain threshold, and quality of life after 4-weeks of treatment. The secondary objective was to discover a relationship between body elements, based on Thai traditional medicine, and pain severity. We hypothesized that CTTM would provide more pain relief than US in LPP-S4L disease.

MATERIALS AND METHODS

Subjects were recruited between May 2019 and November 2020 at the Ayurved Clinic and Rehabilitation Center, Faculty of Medicine Siriraj Hospital. All study participants were randomized by computerized block randomization. There were 33 per group. The research was approved by the ethical committee of the Faculty of Medicine Siriraj Hospital (COA no. Si 648/2018).

The inclusion criteria was participants aged between 18-60 with chronic neck pain, and moderate to severe pain intensity (NRS ≥ 4). All subjects were screened and

diagnosed for LPP-S4L by a licensed Thai Traditional medicine practitioner with over 10 years clinical experience.

Participants were excluded if they met the following criteria: open wound on the neck and related areas, fever with temperature over 38.5°C, history of trauma or surgery involving bones of the neck, shoulder and/or back, inflammatory arthritis, neuropathic pain, pregnant, uncontrolled hypertension (BP>140/90mmHg), use of medication such as analgesics or muscle relaxants within one week of the experiment. Researcher enrolled and assigned participants after signed inform consent.

Court-type Thai traditional massage (CTTM)

Five licensed Thai traditional medicine massage therapists with at least 10 years of clinical experience massaged patients in this study. They were trained using the same massage protocol.[17,48] The massage therapists were in a standing position while patients were in the sitting position during massage. CTTM therapy was carried out for 30 minutes per session, twice a week for a total of four weeks as per standard protocol in clinical practice guideline. CTTM starts as a basic massage of the shoulder, neck and pressure on major signal points on both sides. The treatment targets the trapezius muscle, levator scapulae muscle, splenius muscle and suboccipital muscle. The therapists were randomized for each round of treatment (Fig 1).

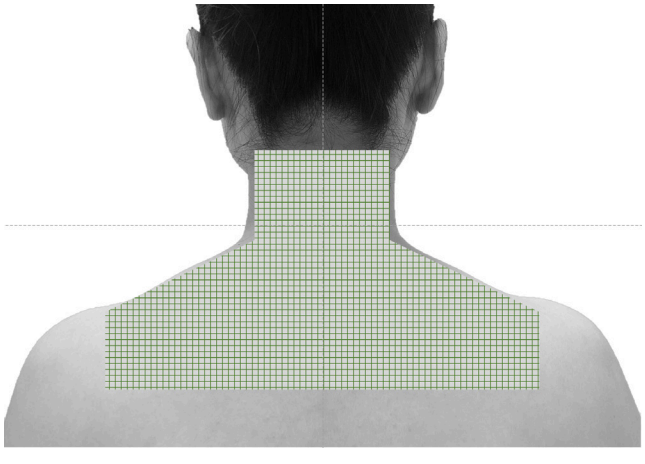

Fig 1. Treatment area.

Ultrasound treatment (US)

Two licensed physical therapists with 10 years of clinical experience underwent training sessions for this study. Ultrasound treatment was set at an intensity of 0.8 W/cm^2 and the frequency was 1 Mhz. Physical therapists were also in the standing position while patients were in the sitting position. Ultrasound treatment was carried out for 10 minutes in each session, twice a week for four weeks following the standard protocol as per clinical practice guidelines. The treatment area covered the common source of neck pain such as trapezius, levator scapulae, splenius and suboccipital muscles (Fig 1).

Outcome measurement

Pain intensity

Pain intensity was measured by the numerical rating scale (NRS). Participants self-assessed pain intensity using a numerical rating scale (0-10). During the study, an assistant researcher inquired about the pain before and after treatment (eight visits). A score of 0 meant no discomfort while 10 indicated maximum pain.

Pressure pain threshold (PPT)

Algometry is a method to measure pain sensitivity. This study used pressure algometry (Algomed algometry, Compass medical technologies, Inc. Medoc advance medical system, U.S.). The PPT was evaluated on the trigger point or the most hard tendon in the upper trapezius muscle which was the major diagnosis area of LPP-S4L. An assistant researcher put algometry force (kg/cm^2) slowly on the point until the participant pressed a button on the algometer response unit to stop the pressure. Data from the same area was collected an average of two times or before and after of treatment.

Range of Motion (ROM)

Two assistant researchers underwent a training session for measuring the ROM of the neck, including flexion, extension, lateral flexion and rotation of both sides using a goniometer. The ROM was collected before and after treatment during the study (eight visits).

Quality of life (SF-36)

SF-36 (short form 36) is a health survey questionnaire that assesses quality of life. SF-36 has thirty-six questions covering eight important points of quality of life, including physical function, role-physical, bodily pain, general health, vitality, social function, role-emotional and mental health. SF-36 is administered before and after the last treatment. This study used SF-36 version 2 (Thai version).[29]

Percentage usage of rescue drug

Each participant received 20 tablets of 500mg acetaminophen (paracetamol). They were asked to state the remaining in each visit.

Dominant body element questionnaire

Participants were evaluated using the dominant

body element questionnaire[30] in their first visit. The body element questionnaire determines innate body elements and present body elements of participants. The innate body elements, including fire, wind, water and earth were obtained by birth month. Meanwhile, present body elements, including Pitta, Vata, Semha, and mixed elements were obtained from 33 questionnaire items. The present body element can be indicated by a higher percentage score.[30]

Statistical analysis

Data was analyzed by using SPSS version 18. Data is presented as the mean, mean difference, SD, changes in value, and percent difference. This study was parallel or independent-group study. Comparison between groups was performed by an unpaired T-test, while a paired Student's t-test was used to compare within group. A comparison of NRS and PTT over the time points was performed by repeated measures ANOVA with the Bonferroni method for the differences within group, and effect of times. The difference between group used unpaired T-test. A *p-value* of less than 0.05 was considered statistically significant.

RESULTS

A total of 69 patients with LPP-S4L were recruited. Three participants were excluded due to low pain score and hypertension. A total of 66 patients with LPP-S4L were enrolled and received treatment twice a week for four weeks, or a total of eight times, with 33 patients per group (Fig 2). The demographic characteristics are presented in Table 1. There was no significant difference in demographic findings between CTTM and US.

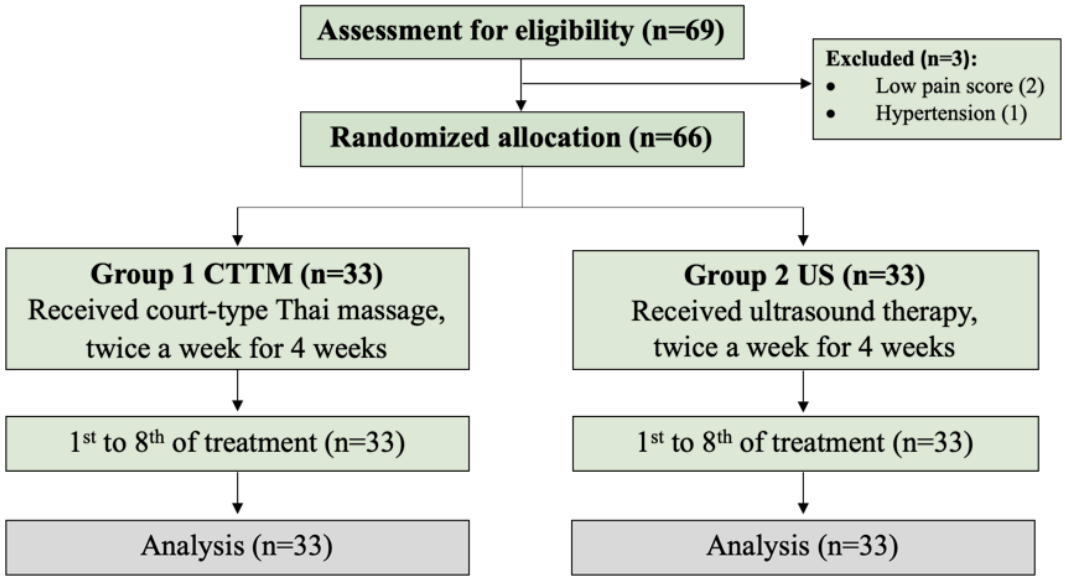

Fig 2. Study flowchart.

TABLE 1. Demographic data of participants.

Characteristics	Total (n=66)	CTTM group (n=33)	US group (n=33)	P-value
Gender; n (%)				
Female	46 (69.70)	23 (69.70)	23 (69.70)	1.000[a]
Age (years);				
Mean ± SD	32.92 ± 6.46	33.8 ± 6.5	32.0 ± 6.3	0.265[b]
Min, Max	24, 48	25, 44	24, 48	
Weight (kg); Mean ± SD	61.86±11.29	59.6±10.2	64.1±12.0	0.102[b]
Height (kg); Mean ± SD	162.62±8.37	161.9±8.6	163.3±8.2	0.494[b]
BMI (kg/m^2); Mean ± SD	23.33±3.59	22.7±3.2	24.0±3.7	0.141[b]

[a] Fisher's exact test, [b] Independent T test.

Pain intensity

Baseline NRS in both groups was not significantly different (Table 2). NRS significantly decreased after treatment at the four-week point in both groups ($p<0.05$). In the CTTM group, the level of pain relief was lower than the US group and significantly different at all time points of treatment over the course of four weeks (Fig 3A).

Pressure pain threshold

Baseline PPT in both groups was not significantly different (Table 2). PPT significantly increased after treatment at the four-week point in both groups ($p<0.05$). In the CTTM group, the level of pain increased more than the US group and was significantly different all time points of treatment over four weeks (Fig 3B).

Neck range of motion

The baseline of neck flexion and neck rotation was significantly different between both groups (Table 2). Both groups showed improved ROM of the neck, including flexion, extension, lateral flexion, and rotation at four weeks. At the four-week point, lateral flexion and rotation improved by 7.56±3.84 and 10.29±5.78 degrees, indicating a significant difference between CTTM and US group ($p=0.038$ and 0.005, respectively).

Quality of life

The baseline of quality of life was acquired from SF-36 in both groups, but it was not significantly different in all parameters (Table 2). There were significant improvements in physical, bodily pain, general health, vitality, social function, and mental health after four weeks of treatment in the CTTM group. In the US group, bodily pain improved significantly after four weeks of treatment. However, after four weeks, there were no significant differences in any other parameters.

Percentage of rescue drug use

No significant differences between the two groups were noted regarding the percentage of use of rescue drug over four weeks. During the eight visits for treatment, only one (3.03%) patient in the CTTM group used two tablets of rescue drug during the third visit because of

TABLE 2. Clinical parameters of patients in both groups before and after the fourth week.

Outcomes	CTTM group (n=33)			US group (n=33)			P-value[b]	P-value[b]
	Before	After (4th week)	P-value[a] before vs after	Before	After (4th week)	P-value[a] before vs after	CTTM vs US Before	CTTM vs US After
VAS	5.58±1.23	0.94±0.93	<0.001*	5.33±0.98	2.42±1.44	<0.001*	0.380	<0.001*
PPT	3.73±1.90	5.91±2.42	<0.001*	2.97±1.46	3.83±1.94	0.003*	0.074	<0.001*
ROM								
Flexion	36.97±10.13	42.09±10.85	<0.001*	44.82±13.60	51.85±8.60	<0.001*	0.010*	0.010*
Extension	36.36±11.02	38.27±9.80	<0.001*	39.42±8.62	37.06±8.74	0.031*	0.214	0.120
Lateral flexion	23.21±5.79	23.83±5.34	<0.001*	20.97±5.06	23.47±4.31	<0.001*	0.099	0.105
Rotation	58.55±9.51	66.61±7.94	<0.001*	68.27±8.55	75.29±9.28	<0.001*	<0.001*	0.025*
SF-36								
Physical function	69.55±20.13	70.91±17.48	0.702	73.48±20.90	74.55±21.04	0.745	0.438	0.448
Role physical	72.73±17.32	78.98±14.97	0.024*	74.05±19.46	78.22±17.48	0.155	0.711	0.851
Bodily pain	32.29±18.07	55.68±17.70	<0.001*	29.92±13.60	50.38±19.13	<0.001*	0.550	0.247
General health	50.21±17.3	59.67±18.19	0.002*	54.79±16.54	57.00±17.49	0.380	0.276	0.546
Vitality	49.06±15.85	60.41±12.85	<0.001*	50.95±15.32	56.25±17.54	0.072	0.625	0.275
Social function	61.36±15.74	75.38±15.14	<0.001*	68.94±17.43	72.35±22.48	0.348	0.069	0.523
Role emotional	75.76±19.80	79.29±18.99	0.364	76.77±20.70	74.49±24.47	0.514	0.840	0.377
Mental health	61.06±14.62	68.33±11.30	0.001*	63.48±12.96	64.67±16.63	0.538	0.479	0.303

[a] Paired t-test. [b] Unpaired t-test. Significant (p-value<0.05).

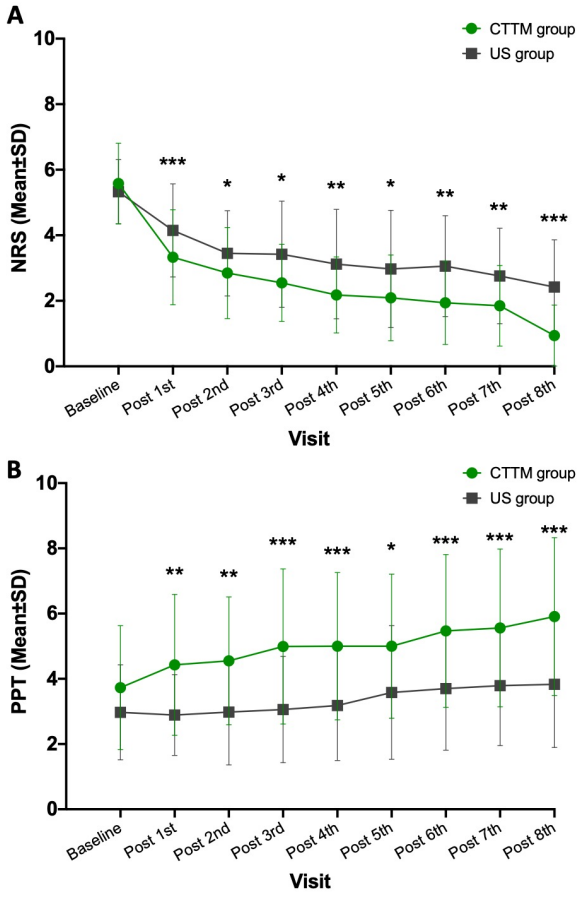

Fig 3. Pain parameters over four weeks of treatment (twice a week). (A) pain score measured by numeric rating scale (0-10). (B) pressure pain threshold (0-10 kg/cm^2). Data compared with mean differences ± SD between CTTM and US groups (n=33 each group). Significant differences between groups are * p-value<0.05, ** p-value<0.01, *** p-value<0.001, unpaired T-test. There were significant differences compared before with over time of NRS and PPT, repeated measured ANOVA with Bonferroni ($^{\#}$p-value <0.001).

menstrual pain. One (3.03%) patient in the US group also used four tablets of rescue drug on the fourth visit due to headache. No side effects were linked to intervention during the study.

Relationship between body elements based on Thai traditional medicine

Both groups showed a similar proportion of innate body elements (Fig 4A). Using the innate body elements to stratify the pain difference (Fig 4B). NRS different for fire, wind, water, and earth elements of CTTM group were 4.75±0.89, 5.20±1.10, 4.55±2.20, 4.33±1.73, respectively. NRS different for fire, wind, water, and earth elements of US group were 2.30±1.42, 2.40±1.34, 4.00±1.41, 3.00±1.61, respectively. Patients with the fire element in the CTTM group showed a greater decrease compared to US group (p<0.001). There were no significant different between group for wind, water, and earth (p-value 0.07, 0.53, 0.09). Both groups also showed a high proportion of the Pita-Vata-Semha element for present body elements (Fig 4C).

DISCUSSION

This study examined the impact of CTTM and US on neck pain relief in patients with LPP-S4L disease. Although the outcomes of massage have been investigated in patients with neck pain, the majority of whom had MPS[16], it was a broader diagnosis than Thai traditional medicine. MPS in the neck can be identified with LPSS-4L disease, LPSS-5L disease, *Lompakang* disease, and *Koh-tok-mhon* disease, among others. Each condition has its own set of treatment regions and protocols. Our study found that LPP-S4L patients in the CTTM as well as US group experienced significant improvements in pain intensity, pressure pain threshold, neck ROM, and quality of life. According to clinical practice guidelines of Thai Traditional Medicine[8], treatment should last at least four weeks. This helps maintain pain relief, muscle tightness, and improves daily life.[31]

Over the course of the study, patients with LPP-S4L who experienced moderate levels of chronic pain were examined for pain intensity. When comparing the before and after treatment across all time points, both treatments exhibited statistically significant reductions in pain intensity. When comparing CTTM to US, the study found a statistically significant difference in impact in terms of lower pain intensity in CTTM across all time points. CTTM can reduce pain by around 50% after the first session and by 80% of baseline after four weeks, indicating clinical therapeutic effects. CTTM treatment claims to be a muscle relaxant.[32] Pain alleviation is achieved by lowering muscular pain and tension in the

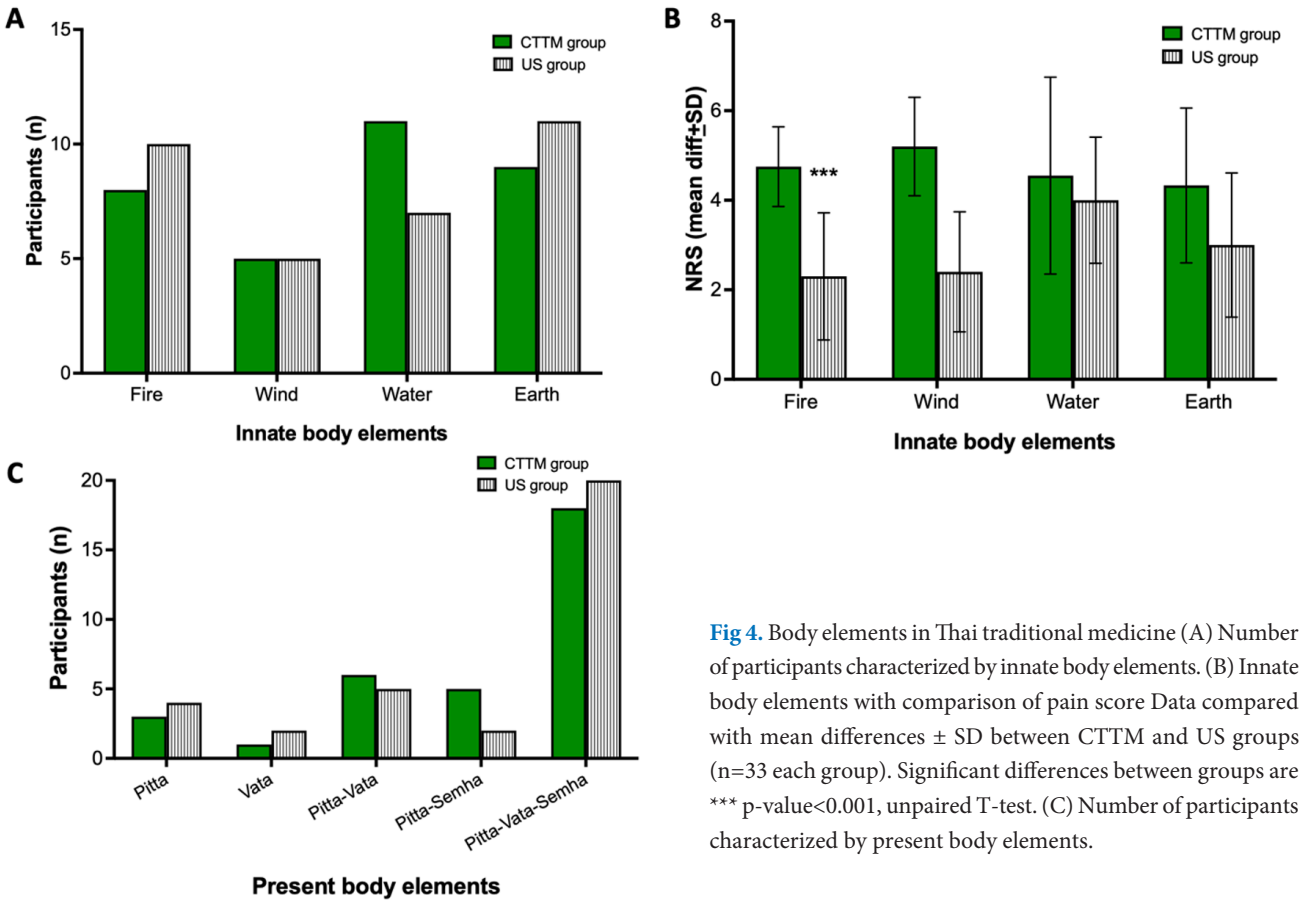

Fig 4. Body elements in Thai traditional medicine (A) Number of participants characterized by innate body elements. (B) Innate body elements with comparison of pain score Data compared with mean differences ± SD between CTTM and US groups (n=33 each group). Significant differences between groups are *** p-value<0.001, unpaired T-test. (C) Number of participants characterized by present body elements.

back of the neck and upper back. These findings were consistent with reports that after four weeks of CTTM and US, the pain response increased.[16,33] In this study, the CTTM group had a higher pain threshold than the US group. The decrease in pain intensity and increase in pain threshold suggests efficacy and pain relief. CTTM is more efficient than the US. This could be because CTTM treatments primarily target tender points and press deeply into the muscle. Its therapeutic effect is derived from various pathways such as stress reduction, increased relaxation, muscle soreness reduction, and improved circulation. While ultrasound therapy works primarily by increasing temperature and improving circulation. Perhaps CTTM is more effective because it has more pain-reduction mechanisms. It may result in less muscle tension than in the US.

The current study found that an increase in ROM in all directions at all time-points was statistically significant when comparing the before and after treatment in the CTTM group. Our findings were similar to those of previous studies. A single course of CTTM treatment for LPP-S4L reduced pain intensity, raised the pain threshold, and increased cervical ROM.[33] However, when compared to US, a different result was reported in a previous study.[34] There was no difference in cervical ROM or VAS between the two treatments. In individuals with cervical MPS, both Thai massage and ultrasonography can dramatically raise cervical ROM while decreasing the pain rating and suffering during activities of daily life. When compared to ultrasound, Thai massage improved patients' capacity to complete daily activities and improve clinical satisfaction.[34]

According to the current study, both therapies can improve quality of life. In the CTTM group, there were significant differences in six out of eight categories, including role physical, bodily pain, general health, vitality, social function, and mental health. However, no statistically significant variations in physical function or emotion were found. There were differences only in the physical pain category in the US group. When comparing the before and after results in the US group, there was no statistically significant difference in other categories. There were also no statistically significant differences between the CTTM and US groups in any category. The findings were comparable to those of a previous report.[15] Participants with neck pain in the CTTM group have higher quality of life in all domains, although there are no statistically significant differences when compared to the control group. The results suggest that CTTM improves quality of life more than US. In this study, no

significant change of quality of life in both groups might be from a ceiling effect of the SF-36 in detecting change before and after treatment.

As per Thai traditional medicine, this investigation evaluated innate and present body elements and found that patients'innate body elements were not dominant, but that both groups had a similar proportion. When the pain intensity was assessed before and after the study, participants with the fire element in the CTTM group had the greatest reduction in pain intensity compared to the US group. Meanwhile, the water and earth elements provided comparable pain alleviation. The present body elements were mostly of the mixed-type (Pitta-Vata-Semha). According to Thai traditional theory, the wind element is the primary cause of pain. It may impact the fire, water, and earth components, resulting in muscle spasms. Thus, people who have the wind element may be more affected than others.[32] CTTM can help reduce muscle spasms and restore normal wind element flow. A large population must be investigated in order to collect all elements for analysis to understand the body elements.

Participant bias may have occurred due to a lack of blind treatment intervention in each group. Since the majority of participants were young, the findings cannot be generalized to all age groups. The proportion of patients with different body elements may not fully represent the relationship between the type of element and the severity of pain. In contrast, this study indicated the overall makeup of patients' body elements. With body elements and age-classified inclusion, a larger sample size should be observed. The effect of CTTM on patients' suffering from various diseases should be investigated further. Also, CTTM's effectiveness beyond a period of three to six months should be established for future clinical trials.

This study determined that a four-week course of CTTM is an appropriate amount of time to treat LPP-S4L and reduce pain intensity. CTTM, a recognized alternative and integrative medicine, can be used as a primary treatment for people suffering from neck pain. However, cost of treatment for CTTM and US differs. While CTTM costs around 300 baht/session (30 minutes), US costs 200 baht/session (20 minutes). Both treatments have minimal side effects. A patient can select his or her treatment based on preference, confidence, risk factors, precaution, and practitioner experience.

CONCLUSION

This study suggests that CTTM and US treatment on the neck muscle twice a week for four weeks is effective in decreasing pain intensity, increasing pain threshold, increasing cervical ROM, and improving quality of life of patients with LPP-S4L. Both treatments are non-drug interventions with no side effects. In addition, the findings in the present study found that CTTM is more effective than US across all domains in patients with LPP-S4L. Moreover, we found that a change in pain intensity relates to differences in the body element in the patient, especially the wind and fire element. Consequently, we recommend using CTTM, an alternative therapy, to treat neck pain caused by LPP-S4L disease. Future research should be conducted to determine the efficacy of CTTM and US for diseases that last longer than three to six months.

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