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Traditional Thai massage steps development in acute ischemic stroke patients

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Chaophya Abhaibhubejhr's Traditional Thai Massage for Stroke

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ABSTRACT

Stroke results in many survivors experiencing limb dysfunction and functional disability. Early rehabilitation has shown promise in improving recovery. Traditional Thai Massage (TTM) is noted for potential benefits in aiding stroke recovery. Chaophya Abhaibhubejhr Hospital in Thailand has integrated TTM in treating various diseases and has developed a specialized TTM protocol for acute stroke patients. We develop 23 unique Traditional Thai Massage Steps based on Chaophya Abhaibhubejhr Hospital Experience and assess the feasibility and safety of combining TTM steps with physical therapy (PT) in treating acute ischemic stroke compared to PT alone. 33 stroke patients were randomized into two groups: intervention (TTM + PT) and control (PT alone). The outcomes were improvements in daily living, quality of life, and acute stroke severity by using a modified Rankin Scale (mRS) score, Barthel index of activities of daily living (BI), National Institutes of Health Stroke Scale (NIHSS), and the Stroke Specific Quality Of Life scale (SS-QOL). Both groups significantly improved outcomes over the 20-day study. However, there were no significant differences between the two groups in these measures. Both groups also reported no adverse effects from the treatments.

- The 23 unique Traditional Thai Massage Steps for acute ischemic stroke based on Chaophya Abhaibhubejhr Hospital Experience are developed.
- TTM protocols for acute ischemic stroke are practical and approved by well-trained Traditional Thai Medicine Practitioners.
- Although TTM protocols do not show additional benefits to conventional PT at day 20 after treatment, their combinations for patients with acute ischemic stroke appear safe and feasible.

Specifications table

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More specific subject area:	Stroke Rehabilitation
Name of your method:	Chaophya Abhaibhubejhr's Traditional Thai Massage for Stroke
Name and reference of original method:	Traditional Thai Massage
Resource availability:	N/A

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Introduction

Stroke is both a major cause of death and a source of long-term disability. While the incidence of stroke has been increasing annually, the mortality rate associated with it has been decreasing. However, this decline in mortality has resulted in a growing number of stroke survivors who face various disabilities. Consequently, disabled stroke patients have become an undesired outcome for many individuals with non-communicable diseases, leading to a significant burden on the overall health of the adult population [1]. When stroke patients receive prompt medical attention upon arriving at the hospital, they have a higher likelihood of receiving immediate treatment and experiencing a better recovery outcome within a few days to three months after the onset [2]. Nevertheless, a substantial proportion of stroke survivors continue to experience significant disability, particularly in the form of limb weakness, which hinders their daily lives [3]. According to a previous study, more than half of stroke survivors experience some level of dysfunction in their limbs, sometimes accompanied by secondary complications such as swelling, muscle spasticity, and muscle wasting [4].

For the past decade, early rehabilitation has emerged as a groundbreaking approach to treating acute ischemic stroke [5]. Initiating shorter, more frequent physical therapy (PT) sessions within the first 24 to 48 h post-stroke has proven safe and effective [6]. Patients who undergo up to two PT sessions daily five days a week shortly after their stroke often experience improved functional recovery three months post-stroke [7]. Furthermore, consistent PT using diverse techniques during the initial three months post-stroke yields positive results [8,9].

Traditional Thai Massage (TTM) is a therapeutic technique utilized in Thai traditional medicine to address various ailments. One notable benefit of TTM is its potential to aid stroke recovery. Historically, TTM's application in stroke treatment has often been introduced during the subacute to chronic stages. When combined with conventional physical therapy, TTM has been shown to diminish muscular spasticity, alleviate anxiety, and reduce depression among stroke patients. Additionally, TTM enhances functional capacity and elevates the quality of life (QoL) for these individuals [10-13].

Chaophya Abhaibhubejhr Hospital, located in Prachinburi Province, Thailand, serves as the primary healthcare facility in the region. Designated as a regional hospital by the Ministry of Public Health, it holds a prominent position in the local healthcare system. Chaophya Abhaibhubejhr Hospital, an esteemed institution specializing in traditional Thai medicine, actively strives to become a prominent center within the ASEAN region. Alongside its primary healthcare services, the hospital encompasses a range of facilities, including the Abhaibhubejhr Day Spa and the Abhaibhubejhr Osot (also known as the 'Abhaibhubejhr Pharmacy'). Additionally, during daytime hours, the hospital offers exceptional Thai massage services [14]. Chaophya Abhaibhubejhr Hospital is at the forefront of integrating TTM into treating various diseases. A ground-breaking TTM formula consisting of 23 steps has been developed for acute stroke treatment. The attending neurologists have recognized TTM as a viable alternative treatment that complements standard approaches for stroke patients.

The effectiveness of combining TTM (Traditional Thai Massage) and PT (Physical Therapy) in treating patients has been established, showing no harmful side effects. However, there needs to be more evidence-based research on the effectiveness of combining TTM with standard treatments for acute stroke. Therefore, this current study aims to develop Thai massage steps based on Chaophya Abhaibhubejhr steps, combined with physical therapy, to assess their feasibility and safety to apply in acute ischemic stroke compared to physical therapy alone. We also conducted a pilot clinical trial to see whether TTM would provide early benefits on disability improvement to conventional PT.

Methods

Selection of Thai massage steps

1. Through a comprehensive literature review and analysis of related research, we established that Thai massage can potentially enhance the function of ischemic stroke patients.
2. We discovered that Chaophya Abhaibhubejhr Hospital had developed 23 steps specifically designed for ischemic stroke patients. These procedures were specifically chosen for their potential benefits in improving circulation, reducing muscle tension, and enhancing overall mobility, which are critical factors in stroke rehabilitation.
3. We carefully examined these steps to identify the ones that would effectively improve the overall body condition of ischemic stroke patients, both in the upper and lower body parts.
4. We ensured that the Thai massage steps were performed by highly trained Traditional Thai Medicine Practitioners who had undergone specific training for this research.
5. The Traditional Thai Medicine Practitioners followed the guidelines provided by Chaophya Abhaibhubejhr Hospital, which encompassed the 23 selected steps.
6. While the primary focus of our study was on patients with ischemic stroke, preliminary testing of the protocol was conducted on a small cohort of healthy subjects at Abhaibhubejhr Day Spa and the Abhaibhubejhr Osot. This was to assess the general acceptance and comfort level of the procedures. The findings indicated a high level of acceptance and no adverse effects, which supported the inclusion of these procedures in the stroke patient protocol.

Fig. 1. Step 1.

Traditional Thai massage sequencing steps

According to Chaophya Abhaibhubejhr Hospital, traditional Thai massage has been utilized for rehabilitating post-stroke patients. The experiences gained from traditional Thai massage were analyzed, synthesized, and condensed into a sequence of 23 steps specifically tailored for stroke rehabilitation. Subsequently, the effectiveness of these 23 steps was investigated when combined with physiotherapy.

The method of Thai traditional massage for post-stroke rehabilitation is as follows:

The step commences with addressing the affected side of the patient in the supine position.

Step 1: Begin by using both thumbs to apply pressure on the plantar aponeurosis, starting from the middle of the anterior transverse arch and moving towards the calcaneus bone. Next, shift your focus to the abductor digiti minimi, pressing along a line from the calcaneus bone towards the anterior transverse arch. Use the little finger side of your hand for this step. Proceed by pressing on the groove between the fingers, starting from the little finger and moving towards the great toe. Maintain pressure with both thumbs, ensuring that the tips of your thumbs touch each other. Continue pressing with both thumbs, following the line from the anterior transverse arch to the calcaneus bone, until you reach the great toe. Lastly, utilize both thumbs to press on the edge of the malleolus bone **(**Fig. 1**).**

Step 2: The practitioner applies pressure to the soleus and gastrocnemius muscles using their thumbs sequentially. To address the soleus muscle, they press upwards from the malleolus bone towards the knee joint. For the gastrocnemius muscle, the practitioner presses downwards towards the Achilles tendon. Using both thumbs, the practitioner places upward pressure on the adductor magnus, adductor longus, and adductor brevis muscles, respectively, by overturning their hands (line 1). Then, they exert downward pressure on the adductor magnus, adductor longus, adductor brevis, and deeper on the gracilis muscle (line 2). Repeating the process, the practitioner once again uses both thumbs to press upward on the adductor magnus, adductor longus, and adductor brevis muscles (line 1). Finally, they apply downward pressure on the adductor magnus, adductor longus, adductor brevis, and deeper on the gracilis muscle (line 2) **(**Figs. 2,3**).**

Step 3: The practitioner places their thumbs together, crossing the tips, and applies pressure to the midpoint where the lateral and medial malleolus meet the tibia bone or the central ankle joint. Then, they proceed to press on the groove that runs from the little finger to the big toe, between the fingers **(**Fig. 4**).**

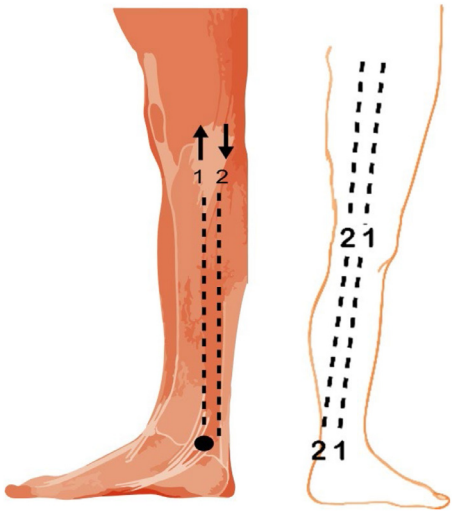

Fig. 2. Step 2.

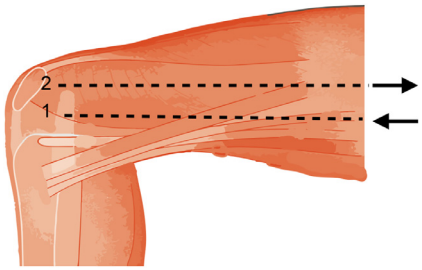

Fig. 3. Step 3.

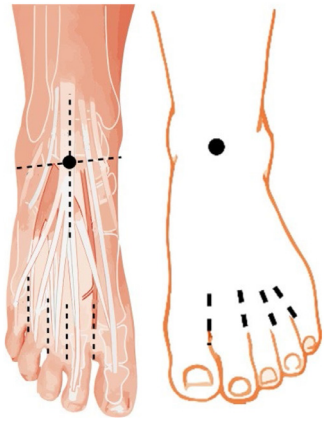

Fig. 4. Step 4.

Step 4: There are three muscle lines on the lateral leg: the tibialis anterior, the extensor digitorum longus, and the peroneal muscles. To address these muscles, the practitioner places their thumbs close together and applies downward pressure along the edge of the tibia bone, starting below the patella bone and moving towards the ankle joint, targeting the tibialis anterior (line 1). At the same time, they apply upward pressure on the extensor digitorum longus (line 2). The peroneal muscles are also addressed by exerting upward pressure with both thumbs, achieved by overturning the hands (line 3). Next, the practitioner flips their hands to an upward position and applies pressure with both thumbs along the edge of the femur bone, targeting the rectus femoris (line 1). Then, they apply downward pressure on the vastus lateralis and iliotibial tract (line 2). Finally, they apply upward pressure on the biceps femoris (line 3) **(**Fig. 5**).**

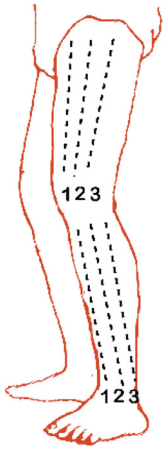

Fig. 5. Step 5.

Fig. 6. Step 6.

Step 5: The practitioner employs both thumbs (fingertips) to perform a downward massage, dividing the pressure between two sections of the gastrocnemius muscle and the Achilles tendon **(**Fig. 6**).**

Step 6: The practitioner uses both palms to administer a leg massage while the patient is in a decubitus position. The focus is on applying pressure to the wind gate point for 45 s on each side **(**Fig. 7**).**

Step 7: Stretching leg muscle

7.1: Begin by using the palm of the same side to stretch the ankle, while the other hand stretches the anterior thigh muscles. Slide the palm downward from the hip to the knee joints to lengthen the quadriceps, tibialis anterior, and peroneal muscles.

7.2: Similar to step 7.1, hold the heel with the palm of the same side and flex the ankle. Simultaneously, use the other hand to stretch the posterior thigh muscles. Slide the palm upward from the knee to the hip joints to lengthen the hamstrings, gastrocnemius, and soleus.

7.3: To relax the dorsal foot, use both indexes and thumbs to clasp the extensor hallucis longus muscle. Start clasping from the middle of the foot and move towards the fingertips. Begin by clasping the thumb and little finger, then proceed to the index and ring finger, as well as the middle finger. Continue clasping from the middle of the dorsal foot to the tip of the fingers **(**Fig. 8**).**

Step 8: The practitioner employs their thumbs to apply pressure on three specific points situated on each palm, namely the hyper-thenar, hypo-thenar, and middle creases. These points correspond to the flexor policis brevis, palmar aponeurosis, and adductor digiti minimi, respectively. The pressure is maintained for a duration of 30 s for each point **(**Fig. 9**).**

Step 9: The technique involves applying pressure with the thumbs, positioned closely together, from the biceps brachii muscles to the wrist joint, avoiding the elbow joint. There are two specific lines for massaging the biceps brachii muscles: Line 1 includes the flexor carpi radialis, pronator teres, and palmaris longus, while Line 2 focuses on the brachioradialis **(**Fig. 10**).**

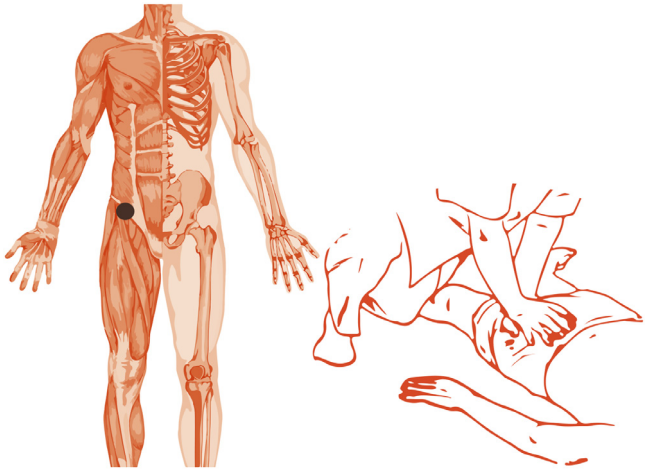

Fig. 7. Step 7.

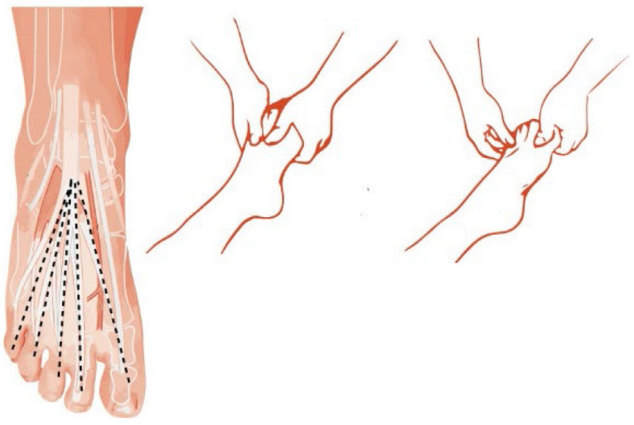

Fig. 8. Step 8.

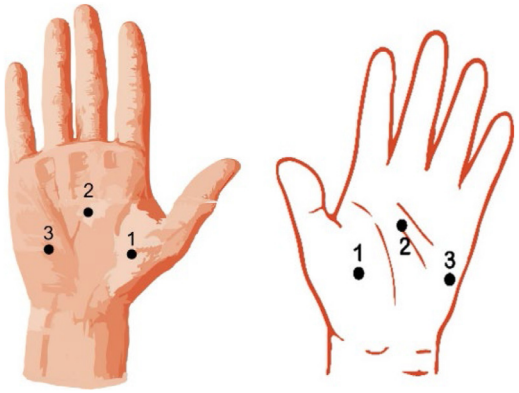

Fig. 9. Step 9.

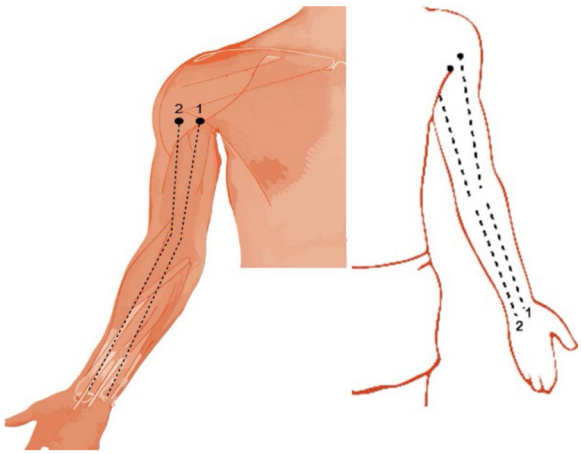

Fig. 10. Step 10.

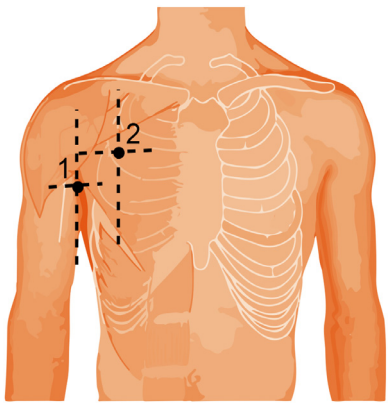

Fig. 11. Step 11.

Step 10: To perform this step, the practitioner employs their thumb to apply pressure at the meeting point of the anterior deltoid and pectoralis major muscles in the axilla (referred to as point no.1). Next, they press on the intersection of the pectoralis minor and the midclavicular line, located below the 2nd rib (known as point no.2). Each point is pressed for a duration of 30 s. (Points 1 and 2 correspond to the pectoralis major muscle.) (Fig. 11**).**

Step 11: The practitioner applies pressure with both thumbs on the dorsal interosseous muscles between the fingers for a duration of 30 s per point. For the spaces between the index and middle fingers, middle and ring fingers, and ring and little fingers,

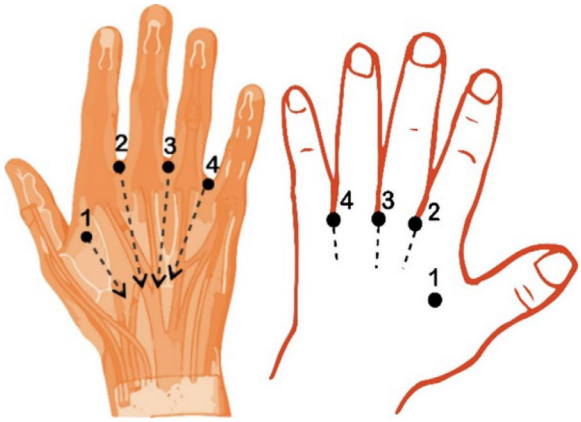

Fig. 12. Step 12.

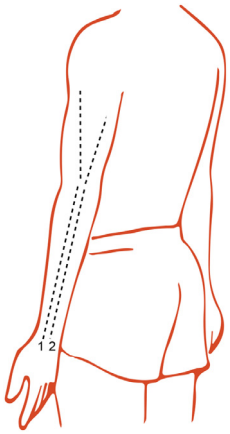

Fig. 13. Step 13.

Fig. 14. Step 14.

the practitioner uses both index fingers and thumbs to firmly grasp the hand's dorsal area from the base to the center groove **(**Fig. 12**).**

Step 12: The practitioner places their thumbs on the triceps brachii muscles, gently pressing and moving towards the forearm region. They then apply pressure to the flexor carpi ulnaris and flexor digitorum muscles, as well as the extensor digiti minimi, which are located on line 1 and exert pressure on the triceps brachii and flexor digitorum. On line 2, they press on the triceps brachii, extensor digitorum, and extensor digiti minimi muscles **(**Fig. 13**).**

Step 13: The practitioner applies pressure with their thumb on the junction of the triceps brachii's head and the teres major for a duration of 30 s **(**Fig. 14**).**

Fig. 15. Step 15.

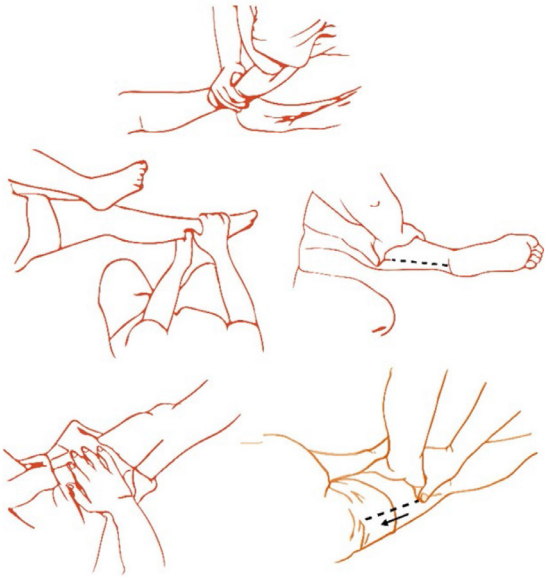

Fig. 16. Step 16.

Step 14: The practitioner utilizes both thumbs to stretch the muscles of the back of the hand, subsequently targeting the spaces between the fingers and the palm to stretch all the fingers **(**Fig. 15**).**

Step 15: In this step, the practitioner applies the elbow press on the foot, similar to Step 1, but only focuses on Lines 1-2. Afterward, using both thumbs, the practitioner presses on the inner side of the leg line, starting from the ankle and moving up to the knee joints, targeting the soleus muscle. Following that, they proceed to press on the posterior leg line, from the Achilles tendon to the knee joint, focusing on the gastrocnemius and soleus muscles. Instead of pressing on the knee joint, they continue to press on the middle of the hamstring muscle until reaching the edge of the buttock. When they reach the edge of the buttock, the practitioner switches to using their palm for pressing **(**Fig. 16**).**

Step 16: The practitioner applies pressure along the back of the leg, near the shinbone, using both thumbs. Starting from the ankle and moving towards the knee joints, the pressure is exerted on the soleus and gastrocnemius muscles. Continuing past the knee joint, the middle of the hamstring muscle is pressed until reaching the outer edge of the buttock **(**Fig. 17**).**

Step 17: The practitioner employs both thumbs to apply pressure on the Iliocostalis muscle, moving from the lumbar to the cervical regions while overturning the hands **(**Fig. 18**).**

Step 18: The practitioner sequentially presses on the rhomboid muscle with both thumbs, one after the other, for a duration of 10 s **(**Fig. 19**).**

Step 19: Using a single thumb, the practitioner applies pressure on the upper trapezius muscle located at the neck's edge for 10 s **(**Fig. 19**).**

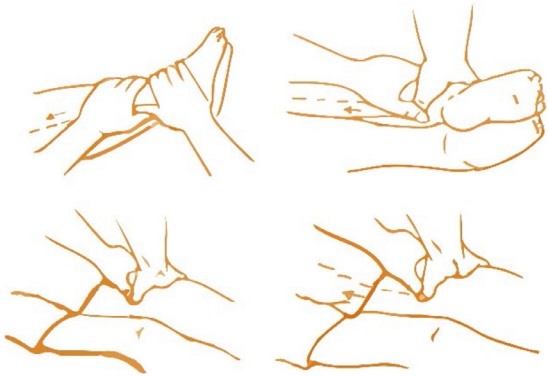

Fig. 17. Step 17.

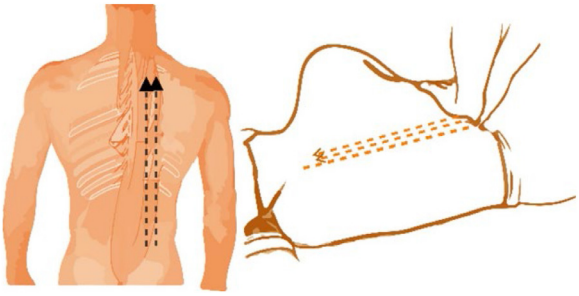

Fig. 18. Step 18.

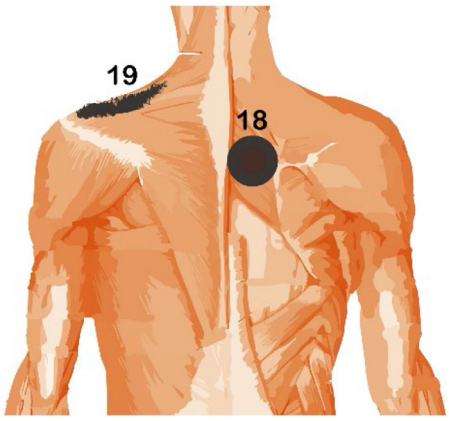

Fig. 19. Step 19.

Step 20: The practitioner utilizes a single thumb to press on the edge of the sternocleidomastoid muscle for a duration of 10 s **(**Fig. 20**).**

Step 21: By employing one thumb, the practitioner applies pressure on the temporalis muscle located over the ear for 10 s **(**Fig. 21**).**

Step 22: The practitioner employs the tips of both palms to press on the Abdominal area in a counterclockwise direction. Starting with the right side, this process is repeated for three cycles **(**Fig. 22**).**

Step 23: While pressing on the upper trapezius and temporalis muscles over the ear with a single thumb, the practitioner also applies pressure on the frontalis muscle and the intersection between the line from the mid-forehead to the occiput and the line from the left to the right ear using both thumbs, one after the other, for a duration of 10 s. **(**Fig. 23**).**

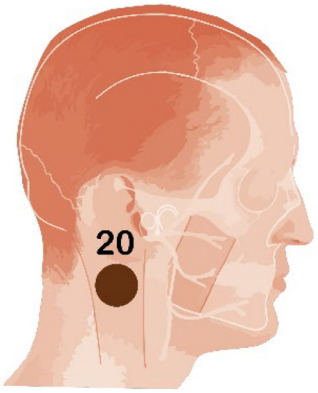

Fig. 20. Step 20.

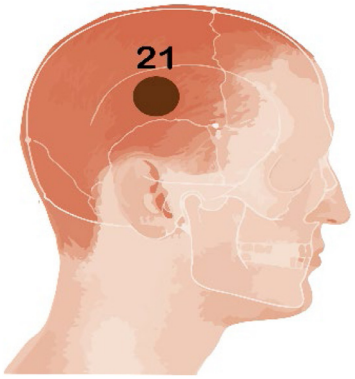

Fig. 21. Step 21.

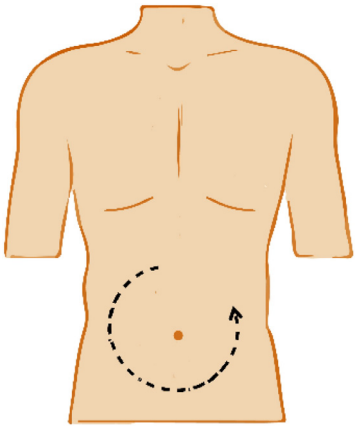

Fig. 22. Step 22.

Clinical data collection

This research focused on investigating the steps of Chaophya Abhaibhubejhr in patients with ischemic stroke who were admitted to Chaophya Abhaibhubejhr Hospital in Prachinburi province.

Population

In this study, a total of 34 stroke patients who received medical treatments at Chaophya Abhaibhubejhr Hospital in Prachinburi Province, Thailand, were recruited. The study was conducted from August 2019 to December 2020 and involved patients diagnosed

Fig. 23. Step 23.

with ischemic stroke by a neurologist. It was a prospective, randomized, controlled trial using an evaluator-single blind technique. Ethical approval with the approval number MTU-EC-OO-6-058/62 was obtained from the Human Research Ethics Committee of Thammasat University, Faculty of Medicine. The study was also registered with the Thai Clinical Trial Registry under the identification number TCTR202000128006.

Sample

Based on Na et al. [15], we used the G-power program with a type I error of 0.05, a power of 90%, and an effect size of 0.5 to determine the sample size [16]. Based on the sample size calculation, a total of 33 participants were considered adequate. The participants were randomized into two groups using a simple random technique generated by a computer: an intervention group (n=16) and a control group (n=17).

The study protocol entailed a five-day consecutive treatment regimen for each participant, subsequent to the acquisition of informed consent. A clinical assessment was conducted to confirm the diagnosis of ischemic stroke. The study cohort comprised 33 subjects who were randomly assigned to either the intervention group or the control group, with 16 in the intervention and 17 in the control group. Standard medical care, inclusive of antithrombotic therapy and prophylactic measures against potential complications, was administered to both groups.

The intervention group underwent an additional treatment regimen involving physical therapy and Thai massage based on the Chaophya Abhaibhubejhr methodology. The Thai massage protocol encompassed 23 specific steps, adhering to the established guidelines of the Chaophya Abhaibhubejhr Hospital. The physical therapy sessions, each lasting 60 min, were conducted in the mornings by a qualified physical therapist. Concurrently, Thai massage, also spanning 60 min per session, was performed in the afternoons by Traditional Thai Medicine Practitioners. This was executed on a daily basis, aligning with the physical therapy schedule.

In contrast, participants in the control group received only physical therapy, identical in duration and frequency (60 min per session, across five consecutive mornings) to that of the intervention group. The physical therapy for both groups was administered by the same therapist, ensuring consistency in treatment delivery. The Thai massage, specifically tailored for this study, was conducted by Traditional Thai Medicine Practitioners who had undergone specialized training for the research project.

In this study, a neurologist employed four measures to evaluate three major aspects of the participants: improvements in daily living, quality of life, and acute stroke severity. The measures included the modified Rankin Scale (mRS) score, Barthel index of activities of daily living (BI), National Institutes of Health Stroke Scale (NIHSS), and the Stroke Specific Quality Of Life scale (SS-QOL). BI and motor power of affected limbs were measured on baseline (before treatment), day one to five during treatment, day six (one day after treatment completion), and day 20 after treatment. While NIHSS and SS-QOL were measured on baseline (before treatment), day six (one day after treatment completion), and day 20 after treatment.

Inclusion/Exclusion criteria

Inclusion Criteria:

- Confirmed diagnosis of ischemic stroke by a neurologist in the last 14 days.
- Hemiplegia resulting in an inability to ambulate.
- Aged 40 to 80 years.
- Provided informed written consent.

Exclusion Criteria:

- Dependent on Activities of Daily Living (ADL) before the recent stroke.
- Previous administration of the rt-PA drug.
- Multiple stroke incidents in the past.
- Unable to finish the designated in-hospital treatment.
- Severe aphasia or consciousness impairment obstructing study understanding or evaluation cooperation.
- Diagnosed with a severe contagious illness.
- Existence of major complications or health issues, including heart or kidney failure, deep vein thrombosis, or significant bone breaks such as a hip fracture.
- Use of a medical device contra-indicated for rehabilitation.
- Experiencing Acute Myocardial Infarction, Unstable Angina, or Chest Pain within the previous month.

Statistical analysis

The main objective of the research was to compare the efficacy of Thai massage combined with physical therapy and physical therapy alone. The clinical characteristics of the participants were reported as mean ± standard deviation (SD) for measurement variables and as percentages for categorical variables. The mean differences of the BI scores, SS-QOL scale, NIHSS, and motor power component in NIHSS within and between the groups were calculated using repeated measure ANOVA tests. A statistical significance level of 0.05 was used, and the data analysis was conducted using SPSS (version 10) statistical software.

Results

Demographic characteristics

A total of 33 stroke patients volunteered to participate in the study, with 19 males and 14 females. The participants were randomly assigned to two groups: an intervention group receiving a combination of Thai massage and physical therapy and a control group receiving physical therapy alone. Both groups had similar clinical characteristics at the beginning of the study. The mean age of the intervention group was 60.92, while the control group had a mean age of 57.0.

The majority of patients in both groups had experienced an acute stroke and joined the intervention program immediately after the onset of the stroke. Seventeen participants fell into this category, followed by 11 participants who had suffered a stroke in one day. The modified Ranking Scale (mRS) scores for both groups ranged from 2 to 4. In the intervention group, nine participants had a score of 4, accounting for 64.29%, while eight participants in the control group had the same score, accounting for 47.06%.

Regarding the participants' medical history, the majority in both groups had dyslipidemia, hypertension, diabetes, and risk factors such as alcohol consumption and smoking. The values of the Barthel Index (BI) for Activities of Daily Living, Stroke Specific Quality of Life scale (SS-QOL), and the National Institutes of Health Stroke Scale (NIHSS) were similar between both groups at the beginning of the study, with no statistically significant differences. Table 1 presents the clinical characteristics of the participants and related measures.

Throughout the study duration, there were no dropouts observed in either patient group. Both groups reported no complications, including muscle pain, arthritis, arthralgia, or fatigue.

Barthel index (BI)

The mean differences in Barthel Index (BI) score for Activities of Daily Living within both groups showed a continuous and statistically significant increase ($P^{<}0.001$) from baseline to day 20. However, there were no statistically significant differences in BI scores between the two groups (P=0.780) during this period, as shown in Table 2.

National institutes of health stroke scale (NIHSS)

The mean differences in National Institutes of Health Stroke Scale (NIHSS) scores within both groups demonstrated a sharp and statistically significant decrease ($P^{<}0.001$) from baseline to day 20. Nevertheless, the two groups had no statistically significant differences in NIHSS scores from baseline to day 20 (P=0.262), as indicated in Table 3.

Stroke specific quality of life (SS-QOL)

The mean differences in Stroke Specific Quality of Life (SS-QOL) scores within both groups revealed a continuous and statistically significant increase ($P^{<}0.000$) from baseline to day 20. However, there were no statistically significant differences in SS-QOL scores between the two groups from baseline to day 20 (P=0.262), as shown in Table 4.

Table 1
Clinical Characteristics of participants.

Clinical Characteristics and Measures	Intervention Group (n = 16)	Control Group (n = 17)	p-value
Age: Mean±SD	60.92(83.12)	57.00(86.9)	0.283
Male: No. (%)	11 (68.75%)	8 (47.06%)	0.171
Female: No. (%)	5 (31.25%)	9 (52.94%)	
TOAST Classification No. (%)			
Large vessel disease	3 (18.75%)	4 (23.53%)	
Cardioembolic	4 (25%)	4 (23.53%)	
Small vessel disease	2 (12.5%)	3 (17.65%)	
Undetermined	7 (43.75%)	6 (35.29%)	
Symptom period: No. (%)			
0 day	8 (50.00%)	9 (52.94%)	
1 days	5 (31.25%)	6 (35.29%)	
2 days	2 (12.5%)	0 (0.00%)	
3 days	0 (0.00%)	1 (5.88%)	
> 3 days	1 (6.25%)	1 (5.88%)	
Modified Rankin Scale (MRS: No. (%)			
score 0	0 (0.00%)	0 (0.00%)	0.624
score 1	3 (21.43%)	5 (29.41%)	
score 2	2(14.29%)	4 (23.53%)	
score 3	9 (64.29%)	8 (47.06%)	
score 4	0 (0.00%)	0 (0.00%)	
score 5	0 (0.00%)	0 (0.00%)	
History of disease: No. (%)			
Hypertension	9 (56.25%)	11 (64.71%)	-
Diabetes	6 (37.5%)	6 (35.3%)	
Dyslipidemia	15 (93.75%)	14 (82.36%)	
Risk factors: No. (%)			
Drinking Alcohol	6 (37.5%)	8 (48.32%)	
Smoking	6 (37.5%)	8 (48.32%)	
Measurement at baseline: Mean±SD			
Barthel index (BI)	61.87(16.80)	62.64(15.72)	0.395
Stroke Specific Quality of Life scale (SS-QOL)	163.86(26.18)	168.82(23.07)	0.312
The National Institutes of Health Stroke Scale (NIHSS)	5.29(1.99)	5.25(1.86)	0.410

Data was analyzed by Chi-Square Tests.
* = p-value <0.05 is considered a statistically significant difference.

Table 2
Mean differences of Barthel index of activities of daily living between groups.

Time	Intervention Group (n=16)	Control Group (n=17)	Mean differences	95% CI mean difference		p-value
				lower	upper	
Baseline	61.88	62.65	−0.77	−12.11	10.57	0.89
day 1	64.38	67.06	−2.68	−14.51	9.15	0.65
day 2	70.94	71.47	−0.53	−13.73	12.66	0.94
day 3	73.13	75.00	−1.88	−14.79	11.04	0.77
day 4	76.88	80.29	−3.42	−16.87	10.03	0.61
day 5	79.06	82.06	−3.00	−16.95	10.96	0.67
day 6	79.38	82.06	−2.68	−16.75	11.38	0.70
day20	88.44	86.76	1.67	−9.73	13.07	0.77

Repeated Measure ANOVA p value from F test between groups =0.780, within groups <0.001.

Table 3
Mean differences of National Institute of Health Stroke Scale (NIHSS) between groups.

Time	Intervention Group (n=16)	Control Group (n=17)	Mean differences	95% CI mean difference		p-value
				lower	upper	
Baseline	5.25	5.29	−0.04	−1.39	1.30	0.95
day 6	2.63	3.65	−1.02	−2.54	0.50	0.18
day 20	1.69	2.88	−1.19	−2.70	0.31	0.12

Repeated Measure ANOVA p-value from F test between groups=0.262, within groups <0.000.

Table 4
Mean differences of Stroke Specific Quality Of Life (SS-QOL) between groups.

Time	Intervention Group (*n*=16)	Control Group (*n*=17)	Mean differences	95% CI mean difference		*p*-value
				lower	upper	
Baseline	163.69	168.82	−5.14	−22.04	11.77	0.54
day 6	190.25	189.94	0.31	−12.25	12.86	0.96
day 20	206.31	194.88	11.43	−4.59	27.45	0.16

Repeated Measure ANOVA p-value from F test between groups =0.719, within groups <0.000.

Table 5
Mean of differences of motor power in the upper extremity between groups.

Time	Intervention Group (*n*=16)	Control Group (*n*=17)	Mean differences	95% CI mean difference		*p*-value
				lower	upper	
Baseline	3.38	3.06	0.32	−0.64	1.28	0.51
day 1	3.44	3.18	0.26	−0.71	1.24	0.59
day 2	3.56	3.24	0.33	−0.69	1.34	0.51
day 3	3.81	3.29	0.52	−0.52	1.55	0.32
day 4	3.94	3.47	0.47	−0.56	1.50	0.36
day 5	3.94	3.59	0.35	−0.68	1.38	0.49
day 6	4.00	3.65	0.35	−0.70	1.40	0.50
day 20	4.19	4.12	0.07	−0.92	1.06	0.89

Repeated Measure ANOVA *p*-value from F test between groups =0.492, within groups <0.001.

Table 6
Mean differences of motor power in the lower extremity between groups.

Time	Intervention Group (*n*=16)	Control group (*n*=17)	Mean differences	95% CI mean difference		*p*-value
				lower	upper	
Baseline	3.38	3.59	−0.21	−0.81	0.38	0.47
day 1	3.50	3.65	−0.15	−0.72	0.42	0.60
day 2	3.63	3.82	−0.20	−0.83	0.43	0.52
day 3	3.75	3.76	−0.01	−0.69	0.66	0.96
day 4	3.94	4.12	−0.18	−0.84	0.48	0.58
day 5	4.06	4.24	−0.17	−0.80	0.45	0.58
day 6	4.13	4.24	−0.11	−0.72	0.50	0.71
day 20	4.31	4.53	−0.22	−0.81	0.38	0.46

Repeated Measure ANOVA p-value from F test between treatment =0.579, Within <0.001.

Motor power (Upper and lower extremities of the affected side)

The mean difference in motor power of the upper extremity of the affected side between the groups indicated a continuous and statistically significant increase in muscle power and upper limb motor power within both groups ($P^{<}$0.001) from baseline to day 20. However, there were no statistically significant differences in the mean values of motor power in the upper extremity of the affected side between the two groups (P=0.492), as shown in Table 5.

The mean difference in motor power of the lower extremity of the affected side between the groups indicated a continuous and statistically significant increase in muscle power and upper limb motor power within both groups ($P^{<}$0.001) from baseline to day 20. However, there were no statistically significant differences in the mean values of motor power in the lower extremity of the affected side between the two groups (P=0.579), as shown in Table 6.

Discussion

Manual therapeutic massage is a widely utilized form of passive physical therapy with roots in ancient medicinal practices spanning various cultures. Originating as one of humanity's earliest healing methods, these massages involve mechanotransduction, where mechanical forces are applied to the soft tissues. By elevating muscle temperature and blood circulation, massages may enhance muscle flexibility and reduce stiffness [17]. TTM is a deep massage that applies brief, sustained muscle pressure. By targeting the body's ten major hypothesized energy channels, known as Sen Sib, it seeks to unblock energy pathways and amplify both awareness and vitality [18].

TTM, inscribed in UNESCO's Representative List of the Intangible Cultural Heritage of Humanity on 12 December 2019, is important local wisdom of Thailand (UNESCO, 2019). The TTM step is derived from Wat Pho's iconography including 60 stone inscriptions

[19]. The Chaophya Abhaibhubejhr Hospital acknowledges the benefits of the TTM, which encompasses 23 distinct techniques, as an alternative treatment for stroke patients. This massage method has been incorporated into the hospital's health promotion initiatives for over ten years. Although, in our study, after 20 days of treatment, there was no significant difference between TTM combined with PT and PT alone in various outcome measures, including the Barthel Index (BI) for Activities of Daily Living, Stroke Specific Quality of Life scale (SS-QOL), and the National Institutes of Health Stroke Scale (NIHSS). It appears to be a safe and viable addition to standard rehabilitation treatments for patients admitted with acute ischemic stroke. All patients who underwent the TTM adhered to the treatment regimen, with no dropouts or immediate complications reported.

Traditional Thai massage is used to address various ailments. The steps for applying Traditional Thai massage for specific conditions are well-documented. For instance, Sucharit et al. have outlined 25 unique steps of traditional Thai massage for treating fibromyalgia [20]. Yet, there is still a need for detailed guidelines on its application for ischemic stroke.

There were limited studies on the subtypes of manual therapeutic massage used during the acute phase of ischemic stroke. Sankaran et al. found that when Ayurvedic massage was administered to patients one-month post-stroke who exhibited flaccidity, it expedited their ability to stand with minimal support and reduced the requirement for antispastic medications upon discharge [21]. As stated in the introduction, prior research on TTM's use in stroke treatment has predominantly focused on the subacute to chronic stages. To our knowledge, this is the inaugural study exploring TTM's application in the acute phase of ischemic stroke.

The preliminary clinical trial did not yield evidence supporting the efficacy of TTM in conjunction with standard PT for rehabilitation in acute ischemic stroke during the initial phases of treatment. Furthermore, the administration of TTM was not associated with any reported adverse events or dropouts. It is important to consider that the statistical power of this pilot study may be insufficient to accurately determine the outcomes, potentially attributable to limitations such as a small sample size, premature assessment of outcomes, or the use of evaluation tools that lack sensitivity.

In summary, using 23 unique TTM steps alongside conventional PT for patients with acute ischemic stroke appears to be safe and feasible. Future research with more participants and extended outcome tracking is needed to determine the potential benefits of these TTM methods when combined with conventional PT for those with acute ischemic stroke.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.mex.2024.102830.

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