

EFFECTIVENESS OF THAI TRADITIONAL MASSAGE ON UPPER LIMB MUSCLE WEAKNESS REDUCTION IN PARKINSON'S DISEASE PATIENTS: A RANDOMIZED CONTROL STUDY

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ABSTRACT:

Background: The prevalence of Parkinson's disease (PD) continues to increase concurrently with the growing aging population globally. Effects of PD are severe and debilitating for its sufferers, with symptoms causing significant loss in capacity to perform activities of daily living (ADL) and reduction in quality of life (QOL). Numerous strategies continue to be formulated and evaluated to help alleviate the symptoms of PD patients including those from the Complementary and Alternative Medicine (CAM) field. Therapeutic massage is one of the widely-used techniques in CAM. Thai Traditional Massage (TTM), is a traditional massage technique which is advocated and used for treating many chronic conditions including muscle weakness. TTM may prove to be useful in treating these symptoms in PD patients. However, the effectiveness of TTM has not been assessed in treatment of PD patients' symptoms. The study aimed to determine the effect of TTM on reducing upper limb muscle weakness of patients and improving their ability to carry out ADL.

Methods: A randomized controlled trial study was conducted at the Parkinson's disease and Movement Disorder Department of King Chulalongkorn Memorial Hospital. Fifty six patients ages 43 and 85 who were divided equally into intervention and control groups completed the study protocol. The control group consisted of standard medical care, the intervention group consisted of standard medical care along with a TTM regimen of six twenty-minute sessions over three weeks. Effectiveness was measured by changes from baseline and 1 week-post completion of a) muscle weakness of upper limb measured by the Isometric Hand Grip Score (IHGS), b) quality of life as measured by PDQ39 questionnaire and c) Unified Parkinson's Disease Rating Scale (UPDRS) for both groups.

Results: The intervention group showed statistically significant improvements in IHGS and UPDRS scores compared to the control group. There were no differences for the PDQ39. Results indicated that TTM produced a positive effect for improving muscle weakness symptoms in PD patients but did not significantly improve QOL in the short-term.

Conclusions: TTM may play a beneficial part in supplementing standard medical therapy for Parkinson's disease patients especially in alleviating symptoms such as muscle weakness caused by the disease.

Keywords: Thai traditional massage, Parkinson's disease, Muscle weakness, Upper limbs, Hand grip, Bradykinesia

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INTRODUCTION

Parkinson's disease (PD) is characterized by a progressive disorder of the nervous system due to a loss of dopamine-producing brain cells. The

etiology of the disease remains unknown but it

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mostly affects those more than 50 years old. Symptoms exhibited by patients include motor symptoms such as tremor, rigidity, bradykinesia, akinesia, postural instability; as well as non-motor symptoms such as muscle weakness, dysesthesia, sleeplessness, dejection, fatigue, thought stagnation, hidrosis and constipation [1]. Muscle weakness particularly leads to deterioration of capacity to perform activities of daily living (ADL) for these patients. Although primarily classified as a non-motor symptom, muscle weakness is also believed to be linked to the pathophysiology of motor symptoms, thus playing a large role in the disease process [2].

As there is still no cure for PD, various therapies continue to be focused on symptomatic relief. Among these is the use of complementary and alternative medicine (CAM). CAM techniques such as massage therapy, acupuncture, aromatherapy, yoga and herbal medicine have been tried for PD patients. Advocacy of CAM techniques for PD patients are even contained in the American Academy of Neurology guidelines[3]. However evidence of effectiveness in terms of rigorously conducted studies remain limited [4]. One of the extensively used therapeutic methods in CAM is massage therapy. Massage therapy makes muscles flexible and smoothens blood and lymph circulation. In addition, it is also perceived to act positively on the vegetative nervous system and reducing stress as well as to activate the parasympathetic nervous system which leading to improved sleep and function of the body's internal systems. Massage therapy has also been advocated as having good effects on improving muscle strength. Its use has been theorized as having positive effects on melatonin[5]. Improving melatonin, which is intrinsically related to dopamine production in the body, may thus impact PD patients, in which there is a dopamine shortage [1].

Thai Traditional Massage (TTM), is a traditional massage technique which originates in Thailand. It has been used for treating many chronic conditions including muscle weakness [6]. As such, TTM may prove to be useful in treating these similar conditions in PD patients. However, the effectiveness of TTM has not been assessed in treatment of PD patients' symptoms. This study aimed to determine the effect of TTM on reducing upper limb muscle weakness of PD patients and improving their ability to carry out ADL.

METHODOLOGY

This was a randomized controlled study carried out at the Parkinson's Disease and Movement Disorder Department of King Chulalongkorn

Memorial Hospital (KCMH), Bangkok, Thailand between February and July 2015. Patients were randomly selected from amongst those diagnosed with PD followed-up at this department. Upon fulfilling the inclusion criteria and giving informed consent they were randomly allocated into intervention and control groups of 28 people each. This sample size was estimated based on previous studies[7, 8] utilizing significant size differences for the Isometric Hand Grip Score (IHGS) and Unified Parkinson's Disease Rating Scale (UPDRS) and applied into a formula incorporating power at 90% and $\alpha=0.05$ [9].

Inclusion criteria for the study were: i) 18-85 years old and diagnosed with PD under follow-up at KCMH ii) exhibited upper limb, shoulder or neck symptoms such as bradykinesia and rigidity iii) stable on PD medication iv) willing and able mentally to give consent. Exclusion criteria were: i) Patients who were pregnant ii) Patients who had fever higher than 38.5 Celsius iii) Patients with bone fractures or other unhealed musculoskeletal disorders iv) Patients with severe osteoporosis v) Patients with an open wound vi) Patients with a systemic infection.

Patients in the control group received standard medical care (with usual medications) without any deviation in treatment for their PD. On the contrary, patients in the intervention group received six twenty-minute TTM sessions over three weeks in addition to standard medical care. The TTM sessions were conducted as per standard protocol outlined in the Wat Po Thai Traditional Medical School, a certified school under the Ministry of Public Health, Education and Labor [10, 11]. All massages were carried out by one single therapist trained and certified by the Wat Po Thai Traditional Medical School.

Using an acupressure technique, the patient's body was massaged to stimulate his/her central nervous system. The massage was conducted following SEN lines which was intended to balance the body's 'energy' [12]. Each twenty-minute massage consisted of massage on both upper limbs equally for 7.5 minutes each, followed by gentle massage of the shoulder, scapula and neck for 4 minutes and finally an overall massage of the upper limbs for 1 minute. During the upper limb massage, warming up was first done via gentle grasping of the palm for 30 seconds, followed by thumb and palm pressing of the 3 lines of the inner and outer arm. These lines were the little finger line, middle finger line and thumb line in the inner arm and the index finger line, middle line and ring finger line in the outer arm respectively [13]. Acupressure points at 5 various points of the middle finger line of the inner and middle line of the outer arm were massaged

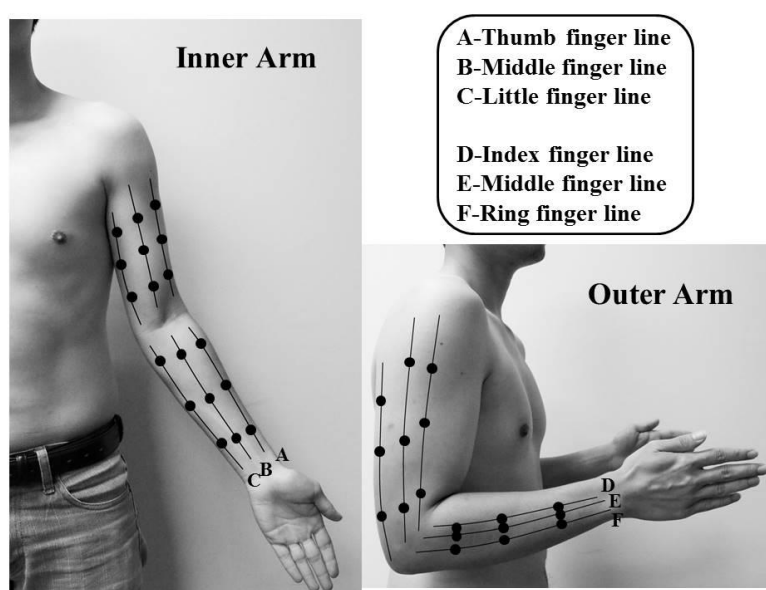


Figure 1 Lines of inner and outer arm

Table 1 General characteristics of intervention group and control group

	Intervention group (N=28)	Control group (N=28)	p-value
Gender (%)			
Male	19(67.9%)	12(42.9%)	0.062
Female	9(32.1%)	16(57.1%)	
Age (years)	66.71±7.44	63.71±11.12	0.241
PD Duration	8.36±4.85	9.39±8.00	0.560
Period on PD Medication (years)	7.21±4.66	8.36±8.10	0.520
Hoehn and Yahr Stage of Disease			
Stage 2	25(89.3%)	20(71.4%)	0.097
Stage 3	3(10.7%)	8(28.6%)	

deeply using the thumb for 3 minutes bilaterally. Figures 1 illustrates the anatomical positions of the SEN lines in the upper limb and the massage technique.

Post recruitment, patients answered a questionnaire on their socio-demographics and disease history. Baseline measurements were also taken at this time with final post-experiment measurements being taken a week after the final massage session. Three major outcomes were defined for this study which were changes in upper limb muscle strength as measured by the Isometric Hand Grip Score (IHGS), their overall PD condition as measured by a Unified Parkinson's Disease Rating Scale (UPDRS) and quality of life as measured by PDQ39 questionnaire. The Isometric Hand Grip Score was measured using a reliable, validated isokinetic dynamometer, a biomechanical objective tool for measuring muscle strength [9]. For this study, a calibrated TAKEI 5001 Hand Grip Dynamometer was used to take measurements from

all patients [14]. The UPDRS, developed since 1980 by The International Parkinson and Movement Disorder Society, has 44 questions and is used to measure clinical conditions of PD patients [15, 16]. The PDQ39 questionnaire is a validated international tool consisting of 39 questions and is used to measure quality-of-life in PD patients.

Chi-square test and Independent T-test was used to test differences in categorical and continuous variables. Differences within groups were measured by differences from the pre and post values for the outcome variables. The Mann-Whitney U test was then used to test for the intervention effect between the groups by comparing the sum of within group differences. Ethical approval was obtained from the Faculty of Medicine, Chulalongkorn University IRB No. 083/58, COA No. 388/2015.

RESULTS

Table 1 shows the general characteristics of both the groups with breakdown in terms of age, gender,

Table 2 Intervention effect on Dependent Variables: Mann-Whitney U test

Variables (Improvement direction↑↓)	Intervention group			Control group			p-value
	Baseline	Post	Difference	Baseline	Post	Difference	
Isometric Hand Grip Score↑	21.75 (8.59)	25.00 (9.04)	3.25	20.89 (8.35)	20.18 (8.39)	-0.71	<0.001**
UPDRS ↓ total score	40.18 (15.96)	36.18 (16.57)	-4.00	37.00 (16.94)	38.50 (18.33)	1.50	0.008*
UPDRS ↓ Upper limb in Part 3 Component	10.64 (4.79)	8.86 (5.60)	-1.78	9.25 (5.67)	9.64 (6.01)	0.39	0.016*
PDQ39 ↓ Total SI (percentage)	24.38 (15.82)	20.72 (12.96)	-3.66	30.24 (13.30)	27.68 (13.78)	-2.56	0.670
PDQ39 ↓ Upper limb component SI (percentage)	25.36 (20.50)	19.64 (12.47)	-5.72	35.36 (18.51)	30.89 (19.05)	-4.47	0.717

Statistical significance was defined as a *p*-value of <0.05*, <0.01** / (0.000=0.001)

Duration of PD, Period on PD medication and Hoehn and Yahr Stage of Disease[17]. There were 19(67.9%) males in the intervention group and 12(42.9%) males in the control group; with 9(32.1%) and 16 (57.1%) females in the intervention and control groups respectively. The mean age for the intervention group was 66.71±7.45 years and 63.71±11.12 years for the control group. The duration of PD was 8.36±4.85 years for intervention group and 9.39±8.00 years for control group. On average, the period on PD medication was 7.21±4.66 years for intervention group and 8.36±8.10 years for the control group. 25 (89.3%) patients of the intervention group and 20 (71.4%) patients of the control group were in Stage 2 of the disease while 3 (10.7%) intervention group patients and 8 control group (28.6%) patients were in Stage 3 of the disease. The two groups did not differ significantly in the baseline when tested for the various variables. Therefore, assessment of the intervention effect was not adjusted in view of the apparent homogeneity.

Table 2 describes the intervention effects within and between the groups for the studied outcomes. There were three research outcomes in this study. The primary outcome was the IHGS which expressed muscle strength. An increasing IHGS score meant improvement of muscle weakness i.e. increasing muscle strength. In this the experimental group showed significant improvements compared to the baseline and also the control group ($p<0.001$). The secondary outcomes were UPDRS and PDQ39 which were measured both for total score and specifically for their upper limbs components. Both these instruments were scored on a decreasing scale, meaning that a lower score meant an improvement in conditions. The UPDRS showed significant improvements both in the total score ($p=0.008$) and the upper limb components ($p=0.016$) for the intervention group compared to the control

group. However neither the total PDQ39 nor its upper limb components specifically showed a significant improvement between the two groups.

DISCUSSION

This study found that a six twenty-minute TTM upper limb massage program was effective in reducing upper limb muscle weakness and improving overall clinical condition of PD patients in KCMH, Bangkok, Thailand.

CAM techniques has been used to treat PD patients effectively. Previous studies conducted in Japan, for example, have reported that acupuncture was effective in increasing movement function in PD patients, but did not increase muscle strength [7]. Japanese *anma* massage, has also been used effectively for PD patients, improving muscle stiffness, movement disorders, pain and fatigue [18].

TTM, on the other hand, has been used effectively to treat chronic lower back pain by providing pain relief and improving range-of-motion for patients [19]. Studies have also showed that TTM has positive immediate and short term effects on increasing hand mobility in patients with movement disorders [20]. However its effect on PD patients has not been tested prior to this study and this thus remains as one of the greatest strengths of this study.

In this study, the improvement of IHGS suggested that TTM helped to reduce muscle weakness on upper limbs. This was likely because muscle strength and hand mobility is considered to be influenced by bradykinesia [2, 21]. TTM, which has been shown to improve hand mobility, may have an impact on bradykinesia as well [20].

According to published literature, grip strength is an indicator of body strength and can also be used to evaluate the self-supported degree of abilities of living activities [22]. Improvements in IHGS thus maybe led to improvement of UPDRS score which

does not evaluate only muscle strength. The different components of the UPDRS are: Part 1-mentation, behavior, mood; Part 2-ADL, Part 3-Motor Examinations and Part 4 –Complications of Therapy [16]. As can be seen, motor examinations and their improvement makeup only a part of the UPDRS components, and thus its large improvement could not be explained merely by an increase in scores of this component. Rather, as TTM improved the upper limb muscle strength, overall body strength also is likely to have improved, which enabled patients to feel an improvement in clinical condition, reflected by the larger UPDRS score.

Though there were numerical improvements in the PDQ39 scores, these improvements were not statistically significant. One explanation for this may be due to the fact that QOL is impacted severely in elderly patients who needed assistance in ADL if they had under 13 kg of grip strength [23]. The patients in this study were all in Hoehn and Yar Stage 2 or 3 and were self-supported with more than 13kg of grip strength even at baseline. Even though their muscle weakness improved, there was no significant improvement in ability to carry out ADL from their pre-existing conditions, thus there was little change in the PDQ39 scores which reflect QOL directly. Another idea relating to this may be the fact that QOL in PD patients was not directly influenced by their ability to carry out ADL but also largely by optimistic thinking or its absence[24]. PD patients are inherently more worried about their condition and its life-long duration and thus have little optimism which may related to the low QOL [25]. In addition, recent research is also exploring the depth of untreated mental depression in PD patients which may also contribute to low QOL amongst them[26]. Improvement of physical symptoms such as muscle weakness, while giving symptomatic relief, may thus not contribute to improve overall QOL as evidenced by the PDQ39 findings.

Besides being one of the first studies to explore the effectiveness of TTM on PD patients, this study's strengths include its rigorous methodology and adherence to scientific research methodology, which is sometimes lacking in studies of CAM. In addition, the calculated sample size is large enough to show proof of effect size. However due to logistic limitations, the study could only be carried out for 6 massage sessions focused on only one body area. It is theorized that longer, continuous whole-body TTM sessions may prove to be of more benefit to PD patients in improving their muscle weakness. Further research is indicated for this, perhaps also utilizing more severe groups of patients and larger samples to

demonstrate more generalizable effects.

As the prevalence of PD continues to grow amongst a rapidly aging population, CAM interventions such as these may prove to be cost-effective in treating it, even as healthcare resources such as medication and caregivers continue to dwindle.

CONCLUSIONS

These study findings suggest that TTM could be used as a complementary therapy for PD patients. Also encouraging was the fact that there were no adverse reactions or side-effects reported in any of the study participants. Alleviating chronic debilitating symptoms of a thus-far incurable disease such as Parkinson's disease via a non-pharmaceutical, non-invasive technique may prove to be of huge benefit to patients who may derive tremendous comfort from their improved condition.

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