ORIGINAL ARTICLE

Efficacy of Zhu's acupuncture techniques to improve muscle strength of motion limbs in stroke patients

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ABSTRACT

Aim. To investigate the efficacy of Zhu acupuncture in motoric ability improvement of stroke patients. This research is a preliminary study in an effort to test the efficacy of Zhu's acupuncture technique in motor improvement in stroke patients.

Methods. This quasi-experimental study, with the pretest and posttest approach without control group design was conducted from June to December 2019 at Holistica Medical Centre Complementary Clinic Palembang, Indonesia. Manual Muscle Testing (MMT) was used before and after the intervention. Zhu's acupuncture was given five times a week for four weeks.

Results Eight patients (four males and four females), who were in the recovery phase (within a period of recovery less than 1 year) after stroke attack were involved. Seven patients experienced improvements in mild and moderate grades for shoulder joint movement after the intervention. Regarding the elbow joint movement, the majority of patients (seven) experienced mild and moderate improvements. Of the total patients who experienced improvement, the majority had mild grade improvements.

Conclusion Zhu's acupuncture technique was effective in improving muscle strength of motion limbs on stroke patients.

Key words: acupuncture therapy, movement, muscle strength, stroke

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INTRODUCTION

Stroke is the second leading cause of death and the third highest cause of disability in the world. In the past two decades, 16.7 million people have suffered the first stroke attack, 33 million stroke survivors and 5.9 million deaths from strokes, with epidemiological numbers increasing every day (1). Data from the American Heart Association state that as many as 795,000 people experience the first stroke or recurrent stroke every year (2). Stroke is not only life threatening, but also gives burdens for post-stroke recovery for survivors. As many as 70% of stroke survivors have functional disabilities and motor dysfunction (3). The ability to interact socially and the ability of daily living activities is limited due to the occurrence of motor dysfunction (3,4). Certainly, this causes a large impact on the quality of life of patients and impacts social activities in the community, which in the end does not only become a health problem but a social problem that needs serious management (3).

The conventional intervention of Western medicine in stroke patients is in the form of pharmacological management, surgical operation and multiprofessional rehabilitation (5). Management with a multidisciplinary approach is carried out to improve functional disability, prevent complications and reduce the risk of stroke re-attacks (5,6).

Acupuncture is one of the alternative or complementary therapies originating from China, where the use of this technique in the health world is increasing (6,7). It is believed that acupuncture is effective in the management of motor dysfunction in stroke patients; even the National Institutes of Health (NIH) has recommended acupuncture as a complementary therapy for the management of motor dysfunction in stroke patients (7-9). The motor area of Zhu's acupuncture or anterior oblique line of the vertex -Temporal scalp acupuncture is a technique commonly used in acupuncture therapy in stimulating motoric dysfunction in stroke patients (10). The motor area of Zhu's acupuncture is equivalent to the structure of the precentral cerebral cortex gyrus on the scalp projection (10,11).

The aim of this study was to uncover the efficacy of acupuncture as a Chinese complementary medicine technique in motoric ability improvement of stroke patients. This study seeks to test the efficacy of Zhu's acupuncture techniques in improving motor movements of the upper and lower extremities of patients who had a stroke. Also, this research is a preliminary study in an effort to test the efficacy of Zhu's acupuncture technique in motor improvement in stroke patients.

PATIENTS AND METHODS

Patients and study design

This research was a quasi-experimental study, with the pretest and posttest approach without control group design. This research was conducted from June to December 2019 at Holistica Medical Center Complementary Clinic Palembang, Indonesia.

The inclusion criteria of this study were stroke patients aged 40-70 years, stroke diagnosed based on cerebral arterial thrombosis criteria in Western medicine (7), stroke ischemia confirmed by brain computed tomography (CT) or magnetic resonance imaging (MRI) scans followed by a stable and good condition of the patient, the patient had just a stroke within 1-6 months after the onset of the attack, stroke with motor limb dysfunction, patients had sufficient cognitive, with a Mini-Mental State Examination (MMSE) score >24 (9), and willing to participate in the study by signing an informed consent.

Exclusion criteria were stroke with decreased consciousness or experiencing serious cognitive impairment, patients with other chronic disorders (Parkinson's disease, cardiac disease, cancers, alcoholism or epilepsy), patients with kidney and liver disorders, patients at risk of bleeding, oversensitivity to acupuncture, participation in other research.

Patients were informed that participation in the study was voluntary and the patients could withdraw from the study at any time. In case of patients' withdrawal from the study, the data will not be deleted, i.e. the patient's data will still be recorded as a medical record. An approval by informed consent was made by each patient before the study start. This study was approved by the Medical Research Unit Committee of the Faculty of Medicine, Universitas Sriwijaya, Indonesia.

Methods

A total of eight patients were examined by Manual Muscle Testing (MMT) before and after the intervention. The intervention in the form of Zhu's acupuncture was given to the patients five times

a week for four weeks. During the intervention with Zhu's acupuncture, all patients were still given conventional rehabilitation treatment in the form of physical and occupational therapy. Western medicine therapy (11) was still permitted to be given in relation to symptomatic treatment, such as antihypertensive drugs, lipid-lowering drugs and platelet aggregation inhibitors. The use of herbal medicines was prohibited during the research process.

Zhu's acupuncture technique. Acupuncture interventions follow the standard for reporting interventions in clinical trials of acupuncture guidelines (10). Two reference parameters of the Zhu's acupuncture technique were applied. 1) The area of intervention was the over anterior central convolution of the cerebral cortex. This point was a line starting from the point (known as the upper point of the motor area) 0.5 cm posterior to the midpoint of the anterior-posterior midline of the head and stretches diagonally to the junction between the brow-occipital line and the anterior border. Next from the angle of the temporal hairline, draw a vertical line up from the midpoint of the zygomatic curve to the brow-occipital line; the intersection of two lines is the projection of the motor area. The motor area was divided into five equal parts: the top fifth is the area of the lower limb motor area, the middle two-fifths were the upper limb motor area, and the bottom fifth was the face motor area. 2) Acupuncture interventions with disposable stainless steel needles (0.25 mm×40 mm) (Huatuo, Suzhou Medical Appliance, Suzhou, Jiangsu Province, China) were manually inserted at an angle of about 15° to a depth of 1.0-1.5 cm along the top and middle points of the motor area on the scalp. To overcome motor dysfunction, the needle was rotated at least 200 revolutions per minute for 1 minute every 10 minutes for a total of 60 minutes. Scalp acupuncture treatment was carried out by an independent certified practitioner (acupuncturist) with 5 years of clinical experience.

Outcome measure. The outcome assessment included a demographic status (age, gender, educational background, marital status) and vital signs in the form of pulse rate, respiratory rate, temperature and blood pressure, as well as Manual Muscle Testing (MMT) (11) in order to quantify the strength of the motor movements of the limbs.

The procedure of the MTT was the following (12). For each muscle tested, the examiner stood to the side being tested, and the patient was sitting upright and in positions to allow full movement of the joint against gravity. The examiner demonstrated the desired movement against gravity. The examiner then requested the patient to repeat the motion. If the patient could move through the desired range of motion against gravity, the examiner attempted to apply resistance in the testing position while stating "Hold it, do not let me push it down" or "Hold it, do not let me bend it". Supposing the patient tolerated no resistance, the muscle score is in Grade 3, if the patient tolerated some resistance, the score is Grade 4, and full resistance, Grade 5. If the patient could not move against gravity, the patient was repositioned to allow movement of the extremity with gravity eliminated. If supporting the limb, the examiner provided neither assistance nor resistance to the patient's voluntary movement. This gravity-eliminated positioning was varied for each muscle tested. If the patient could not complete at least a partial range of motion with gravity eliminated, the muscle or tendon was observed and palpated for contraction.

Statistical analysis

An univariate analysis was performed with presentation of data frequency distribution, bivariate analysis to compare MMT values before and after the intervention with Student's T dependent test. Statistical significance was adjusted at $p<0.05$.

RESULTS

The average age of eight patients involved in this study was 54.7 years, and they were still classified as working age. All patients followed the research intervention process from beginning to end. All patients were employees both as civil servants and private employees. The majority of patients, six, had high education (bachelor degree) and two patients had low education (high school graduates). All patients were married and all spouses of patients were still alive. All patients were with vital signs (good condition), except two patients with systolic blood pressure of 140 mmHg, but both had taken antihypertensive drugs (Table 1).

The majority of patients, seven, experienced improvements in mild and moderate grades for shoulder joint movement after the intervention. Re-

Table 1. Baseline characteristics the patients

Characteristics	Frequency
Age (Mean ±SD) (years)	54.7
Gender (No, %)	
Male	4 (50)
Female	4 (50)
Education (No, %)	
Low	2 (25)
High	6 (75)
Married (No, %)	8 (100)
Employement (No, %)	
Civil servant (No, %)	6 (75)
Private (No, %)	2 (25)
Vital signs (Mean±SD)	
Pulse (Mean±SD	88.7
Respiratory rate	20.7±1.4
Temperature	36.7±1.8
Sistolic blood pressure	130.7±10.2
Diastolic blood pressure	86.7±7.9

garding the elbow joint movement, seven patients experienced mild and moderate improvements but of the total seven patients who experienced improvement, the majority were of mild grade improvements. Regarding the improvement of hip joint movement, seven patients experienced mild and moderate improvements. The knee joint movement also improved, where seven experienced mild and moderate improvement. Ankle joint movement showed significant improvement (p=0.009) where eight patients experienced moderate grade improvement, and no patients without any improvement (Table 2).

Table 2. Result of Manual Muscle Testing (MMT) in eight patients

Joint type and motion	No (%) of patients with		
	No improvement	Mild (<2)	Moderate (2-3)
Shoulder joint movement			
Abduction	1 (12.5)	4 (50)	3 (37.5)
Adduction	1 (12.5)	4 (50)	3 (37.5)
Flexion	1 (12.5)	4 (50)	3 (37.5)
Extension	1 (12.5)	4 (50)	3 (37.5)
Elbow joint movement			
Flexion	1 (12.5)	5 (62.5)	2 (25)
Extension	1 (12.5)	6 (75)	1 (12.5)
Wrist joint movement			
Flexion	1 (12.5)	1 (12.5)	5 (62.5)
Extension	1 (12.5)	1 (12.5)	5 (62.5)
Hip joint movement			
Bridging	0	5 (62.5)	3 (37.5)
Abduction	1 (12.5)	3 (37.5)	4 (50)
Adduction	1 (12.5)	3 (37.5)	4 (50)
Flexion	1 (12.5)	3 (37.5)	4 (50)
Extension	1 (12.5)	4 (50)	3 (37.5)
Knee joint movement			
Flexion	1 (12.5)	4 (50)	3 (37.5)
Extension	1 (12.5)	4 (50)	3 (37.5)
Ankle joint movement			
Dorsal flexion	0	3 (37.5)	5 (62.5)
Plantarflexion	0	4 (50)	4 (50)

Shoulder joint movement showed statistically significant improvement in the MMT score around 1.25 (p=0.015). The elbow joint movement showed an improvement in the score of around 1.25 points (p=0.016). The wrist joint of about 2.25 (p=0.016), hip joint by about 1.5 points (p=0.016), the knee joint by about 1.3 points (p=0.016), and ankle joint movement improved score by 1.62 points (p=0.009) (Table 3).

Table 3. Manual Muscle Testing (MMT) score change

Joint type	Motion	Muscle strength (Mean±SD)	p
Shoulder joint	Abduction before Abduction after	2,25 ± 1.16 3.50 ± 1.51	0.015
	Adduction before Adduction after	2.25 ± 1.16 3.50 ± 1.51	0.015
	Flexion before Flexion after	2.25 ± 1.16 3.50 ± 1.51	0.015
Elbow joint	Extension before Extension after	2.12 ± 1.12 3.43 ± 1.54	0.016
	Flexion before Flexion after	2.50 ± 1.30 3.93 ± 1.65	0.016
	Extension before Extension after	2.50 ±1.30 3.75 ± 1.62	0.016
Wrist joint	Flexion before Flexion after	1.25 ± 1.58 3.43 ± 1.45	0.016
	Extension before Extension after	1.25 ±1.58 3.43 ±1.45	0.016
Hip joint	Bridging before Bridging after	2.75 ± 0.88 4.37 ± 1.06	0,010
	Abduction before Abduction after	2.37 ± 1.30 4.00 ± 1.77	0.016
	Adduction before Adduction after	2.37 ± 1.30 4.00 ± 1.77	0.016
	Flexion before Flexion after	2.37 ± 1.30 4.00 ± 1.77	0.016
	Extension before Extension after	2.37 ± 1.30 4.00 ± 1.77	0.016
Knee joint	Flexion before Flexion after	2.62 ± 1.18 4.00 ± 1.69	0.016
	Extension before Extension after	2.50 ± 1.19 3.87 ± 1.72	0.016
Ankle joint	Dorsiflexion before Dorsiflexion after	2.00 ± 1.19 3.62 ± 1.30	0.009
	Plantarflexion before Plantarflexion after	2.25 ± 1.16 3.75 ± 1.28	0.010

DISCUSSION

Zhu's acupuncture technique is a contemporary acupuncture technique that combines basic acupuncture techniques and modern medical science by understanding the acupuncture points of the cerebral cortex area on the human scalp (13). The application of acupuncture in different treatments is growing, even now more and more physicians are developing modern neurophysiology that utilizes acupuncture techniques and seeks to explore the relationship of brain and human body

(14). The Zhu acupuncture technique seeks to harmonize the brain and body (14,15). Based on the principles of traditional medicine, there are meridian points that act as regulators of various organs and limbs (10). Meridian is an energy transfer circuit and pathway that connects various organs in the body (14). Stimulation of various meridian points will trigger the activation of energy transfer, which will drive electrical activity in the target organs connected to the meridian pathway (10-14). The meridians also connect peripheral organs such as the upper and lower limbs to the cerebrum via the meridian pathway, or in modern medical science known as the spinal cord pathway (15). The GV 20 meridian is located in the vertex, it is believed that, if it is able to stimulate, it will produce energy to the central nervous system in the brain and be able to trigger electroactivity at motor points in the brain's precentral gyrus. Electroactivity at the motor point at the centre of the motor in the cerebrum will trigger the transfer of impulses to the peripheral upper and lower limbs (13).

The results of this study showed that intervention in stroke patients with the Zhu's acupuncture technique can improve the motion of various joints of the upper and lower limbs. Based on the results of this study it can be seen that there is a gradation in the improvement of the motion strength of the upper limbs between shoulder, elbow and wrist joints. The more peripheral location of the joint motion, the better the joint motion improvement was achieved. The improvement in wrist joint motion was far better than the repair in the elbow or shoulder joint. This can be related to the effectiveness and optimization of energy transfer through the meridian pathway. Peripheral joints, wrist joints, are smooth motion joints that are moved by small motion muscles and consequently, because they are moved by small motors, the transfer of energy given to move smooth motion muscles in peripheral joints is less than moving large muscles that move large joints (13-17). Likewise, it happens in the improvement of lower motion where visible gradation-differences in motion joint repair.

Improved ankle joint MMT score was better than knee and hip joint motion repair in this study. However, there is also a difference in the repair of the ankle and the wrist joint in the periphery, where the wrist joint has a much better improvement than the ankle joint (13-17). This is caused by the muscles that build the wrist joint smaller than the muscles that make up the ankle joint. The small muscles that build joint motion will be more optimal because energy transfer through the meridian points can be more optimal, and joint motion will be better than before acupuncture (13-17). Several studies that are in line with this study have shown the efficacy of acupuncture in improving body function and quality of life in stroke patients (18-22).

However, this study has a limitation because it included a small number of patients.

In conclusion, Zhu's acupuncture technique was effective in improving muscle strength of motion limbs on stroke patients. Further research needs to be done with a larger sample, so it is expected that acupuncture can be used as additional therapy for post stroke repair.

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Conflict of interest: None to declare.

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