

Original Article

Effect of acupuncture on post-stroke depression

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Abstract: Objective: The goal of this study was to evaluate the effect of acupuncture on patients with post-stroke depression. Methods: A total of 108 patients with post-stroke depression were randomized into the observation group and the control group, with 54 cases in each group. The control group was treated with routine medication, psychological counseling, and rehabilitation exercise, while the observation group received acupuncture in addition to the aforementioned treatments. The treatment effect and prognosis were evaluated according to the Hamilton Depression Rating Scale (HAMD), Self-Rating Anxiety Scale (SAS), National Institutes of Health Stroke Scale (NIHSS), the modified 36-item Short-Form Scale of Health-related Quality of life, and manual muscle testing before and after treatment. Results: The scores of the HAMD, and the degree of clinical neurological deficit in the two groups after treatment were significantly improved (all $P < 0.05$), but the above measures in the observation group were better than those in the control group (all $P < 0.05$), and the scores of quality of life (QoL) ($P < 0.001$) and muscle function ($P < 0.05$) in the observation group were superior to those in the control group. Conclusion: Acupuncture enhances clinical treatment effect, improves psychological state, promotes recovery of muscle strength, and thus improves QoL of patients with post-stroke depression, and can be applied as a routine complementary treatment among those patients.

Keywords: Post-stroke depression, acupuncture, quality of life, effect evaluation

Introduction

Stroke, also called cerebrovascular accident, is at present one of the major causes of death or disability worldwide. A study has shown that ischemic stroke accounts for approximately 85% of all strokes worldwide [1]. A stroke is briefly characterized by a series of sudden brain dysfunctions attributed to cerebral ischemia in terms of basic pathological changes [2, 3]. Given the distribution of intracranial blood vessels, stroke patients show different clinical manifestations like limb dyskinesia, sensory disturbance, hemianopia caused by optic nerve damage, and cognitive impairment [4, 5]. Post-stroke emotional disorder has currently gained increasing attention from researchers with the deepening of research about stroke. Some studies have shown that post-stroke depression can substantially increase the risk of mortality of stroke patients, while more than 80% of stroke patients suffer from depression, seri-

ously affecting the quality of life (QoL) of the patients [6, 7]. It can be seen that therapies on post-stroke depression should be regarded as a major part of stroke treatment.

The main clinical manifestations of post-stroke depression are low spirit with hypobulia, and low interest in the surroundings, frequently accompanied by anxiety symptoms. The etiology of post-stroke depression through research still remains unclear at present, and primary endogenous depression theory, and emotional changes caused by post-stroke somatic changes play important roles in the pathogenesis of post-stroke depression [8]. Changes in post-stroke levels of neurotransmitters like serotonin, and catecholamine hormones result in changes in the transmission route of cerebral neurons, thus leading to depression, in terms of the primary endogenous theory [9]. Physical disabilities after stroke in most patients will convert the role of patients in physiology, family

and society, thus breaking the physiological and psychological balance and eventually leading to negative emotions [10].

Targets for treating post-stroke depression at present are mainly focused on improvements of neurotransmitters and motor function. Animal experiments have demonstrated that acupuncture can achieve good results in both of the aforementioned aspects [11]. Therefore, this study aimed to evaluate the clinical effect of acupuncture on patients with post-stroke depression in terms of psychological state, QoL, motor function, and neurological function.

Materials and methods

Subjects

A total of 108 patients with post-stroke depression admitted to the Department of Encephalopathy of Gansu Province Academy of Traditional Chinese Medicine from September 2014 to September 2017 were recruited, and randomized into observation group and control group according to the order of admission, with 54 cases in each group. Both groups of patients presented variable degrees of upper limb dysfunction, and muscle strength of the affected upper limbs was grade 2 or above. Inclusion criteria were: (1) subjects who were diagnosed with post-stroke depression occurred within 2-6 months after an interventional or conservative therapy conforming to the diagnostic criteria of depression in the Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association [12]; (2) subjects whose depressive symptoms lasted at least 2 weeks; (3) subjects who aged more than 20 years but less than 75 years; (4) subjects whose diagnosis for stroke conformed to the diagnostic criteria of stroke established by WHO [13], and who were diagnosed with cerebral infarction or cerebral hemorrhage by computed tomography and magnetic resonance imaging of the head, with a shared lesion site in both kinds of images; (5) subjects who were at the first-ever onset for stroke; and (6) subjects who had clear consciousness to cooperate with inspectors. Exclusion criteria included (1) multiple attacks of cerebrovascular accidents; (2) a history of mental illness; (3) cognitive impairment; (4) dysfunction in major organs like heart, liver, lung, and kidney; (5) malignant

tumor; and (6) a history of depression. The study was approved by the Medical Ethics Committee of Gansu Province Academy of Traditional Chinese Medicine, and informed consents were obtained from all the patients or their families.

Methods

The two groups of patients, after admission, were given routine basic treatment in the Department of Neurology, including medication of aspirin (Bayer, Germany) combined with clopidogrel (Sanofi, Hangzhou, China), and medication for blood lipid control, blood sugar adjustment, and internal environment stabilization. Routine intravenous medication was given to alleviate brain edema, nourish brain cells, and energize brain cell function. In addition, all the patients of the two groups were given timely psychological counseling and necessary physical rehabilitation exercise.

In addition to the aforementioned conventional treatments, acupuncture was used in the observation group.

The main method of acupuncture adopted in this study was Xingnao Kaiqiao needling method [14]. The method of reinforcing and reducing by lifting and thrusting the needle, manipulation technique of lifting and thrusting the needle with inward twirling and rotating movements, and head matrix needling method was used in this study. Acupoints like Neiguan (PC6), Weizhong (BL40), Sanyinjiao (SP6), Sibai (ST2) and Sizhongxue (located one chun outside each of Sishencong (EX-HN1)) were mainly selected. Other acupoints were selected according to the specific conditions of the patients. The needling treatment was carried out once a day, seven days a course of treatment, four courses a cycle, and all patients in the observation group received two cycles of treatment.

Outcome measures

Primary outcome measures: Psychological status of all the patients before and after treatment was assessed with the Self-Rating Anxiety Scale (SAS) and the Hamilton Depression Rating Scale (HAMD). In terms of SAS, the scores of <50 were referred to no anxiety, the scores of 50-59 to mild anxiety, the scores of 60-69 to

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Table 1. Comparison of baseline characteristics between the two groups

	Observation group	Control group	t/ χ^2	P
Age (year)	65.1±10.1	63.3±9.9	0.935	0.352
Sex (male/female)	30/24	28/26	0.037	0.847
Smoking history (case)	14	16	0.046	0.830
Diabetes (case)	15	14	0.044	0.833
Hypertension (case)	22	20	0.039	0.844

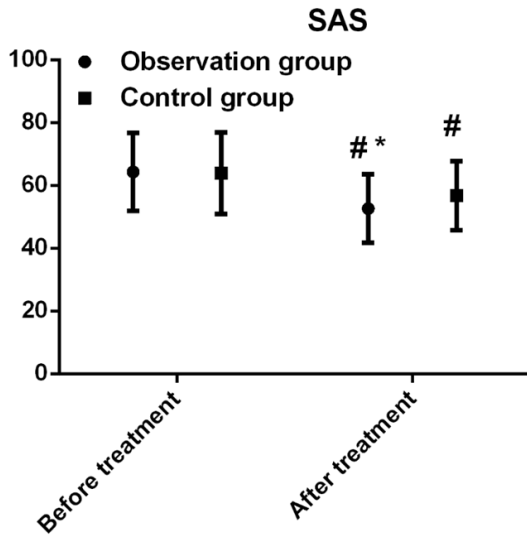


Figure 1. Comparison of SAS scores between the two groups before and after treatment. Note: SAS, Self-Rating Anxiety Scale; the comparison of SAS score between the two groups before and after treatment, * $P < 0.05$; the comparison of SAS score between the observation group and the control group after treatment, * $P < 0.05$.

moderate anxiety, and scores of ≥ 70 to severe anxiety [6]. HAMD evaluated the treatment effect according to the reduction rate, with $\geq 75\%$ being cured, 50%-75% (excluding 75%) being markedly effective, 25%-50% (excluding 50%) being effective, and $< 25\%$ being ineffective. Total effective rate = markedly effective (cases) + cured (cases) + effective (cases)/total cases of a group * 100%.

Secondary outcome measures: Improvement or otherwise of neurological function of all the patients before and after treatment was assessed with the National Institutes of Health Stroke Scale (NIHSS). The higher the score, the higher severity the neurological impairment.

The improved 36-item Short-Form Scale of Health-related Quality of life was used to assess

the QoL, with eight domains for evaluation, including general health perception, limitations in usual role activities due to physical health problems (role physical), limitations in social activities due to physical or emotional problems (social functioning), limitations in usual role activities due to emotional problems (role emotional), bodily pain, limitations in physical activities due to health problems (physical function), general mental health, and vitality. The higher the score, the better the QoL. *Manual muscle testing* was used for estimating muscle strength, and the Changes in muscle strength of the upper limbs of the two groups of patients before and after treatment were recorded and statistically compared.

Statistical analysis

The data obtained in this study were analyzed using the SPSS software, version 20.0. Normal measurement data are expressed as mean \pm standard deviation ($\bar{x} \pm sd$). Intra-group comparison of data with independence, normality, or equal variance was performed by a paired t-test. Inter-group comparison was performed by an independent t-test. A Chi-square test was used for comparison of the enumeration data. $P < 0.05$ was considered statistically significant.

Results

Comparison of baseline characteristics between the two groups

There was no statistical difference in age, sex, and numbers of cases of smoking, diabetes, and hypertension history between the two groups (all $P > 0.05$), and the two groups were comparable as shown in **Table 1**.

Changes in evaluation indexes of negative emotions

There was no statistical difference in SAS scores between the two groups before treatment. The scores of evaluation indexes of negative emotions of the two groups after treatment decreased compared with those before treatment (both $P < 0.05$), while the scores of the patients in the observation group decreased more significantly than those in the control group ($P < 0.05$) as shown in **Figure 1**.

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Table 2. Comparison of the total effective rates of HAMD between the two groups

	Observation group	Control group	χ^2	P
Cured (cases)	12	7		
Markedly effective (cases)	15	10		
Effective (cases)	10	8		
Non-effective (case)	17	29		
Total effective rate	68.52% (37/54)	46.30% (25/54)	4.582	0.032

Note: HAMD, the Hamilton Depression Rating Scale.

decreased more significantly than those in the control group ($P < 0.05$), indicating that acupuncture has a positive effect on improving the neurological functions of the patients with post-stroke depression as shown in **Figure 2**.

Changes in quality of life scores of both groups

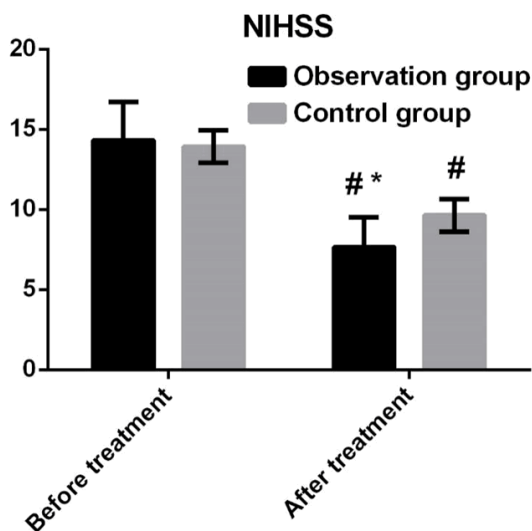


Figure 2. Changes in NIHSS of both groups before and after treatment. Note: NIHSS, the National Institutes of Health Stroke Scale; the comparison of NIHSS score between the two groups before and after treatment, $^{\#}P < 0.05$; the comparison of NIHSS score between the observation group and the control group after treatment, $^{\#}P < 0.05$.

Comparison of total effective rates of HAMD between the two groups

This study showed that the total clinical effective rate of HAMD in the observation group is higher than that in the control group, with statistical difference, indicating that acupuncture is superior in relieving depression evaluated by HAMD, as shown in **Table 2**.

Changes in NIHSS of both groups

No statistical difference was shown in NIHSS scores between the two groups before treatment. The NIHSS scores of the two groups after treatment decreased compared with those before treatment (both $P < 0.05$), while the scores of the patients in the observation group

The QoL score of the patients in the observation group after treatment was higher than that in the control group ($P < 0.001$), indicating that acupuncture exerts a good effect on improving QoL of the patients with post-stroke depression, as shown in **Table 3**.

Changes in muscle strength of upper limbs of both groups

There was no statistical difference in muscle strength of the upper limbs between the two groups before treatment. The improvement in the muscle strength of upper limbs in the observation group was superior to that in the control group (all $P < 0.001$), indicating that acupuncture treatment has certain effect on the recovery of body function of the patients with post-stroke depression. See **Table 4**.

Discussion

Depression is a common stroke complication in Neurology Department with an increasing number every year, and it often occurs within 2-6 months after the occurrence of cerebrovascular events [15]. Post-stroke depression changes the psychological state of patients, and has a negative impact on their daily life. In addition, physical disability caused by stroke further diminishes their QoL already reduced before [16]. At present, the endogenous mechanism of depression due to stroke is mainly ascribed to the changes in neurotransmitters that cause problems in neuronal transmission with affection to the regeneration of hippocampal nerve. An animal experiment has proved that regeneration disorders of hippocampal neurons can also cause depression [17].

Acupuncture is currently the basic treatment for post-stroke depression, and it also serves for treating motor dysfunction caused by stroke.

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Table 3. Comparison of the scores on the 36-item Short-Form Scale of Health-related Quality of life between the two groups after treatment

	Control group	Observation group	t	P
General health perception	64.29±2.99	75.29±2.10	22.123	<0.001
Role physical	64.33±5.21	79.53±4.09	16.863	<0.001
Social functioning	75.26±3.49	81.54±3.57	9.244	<0.001
Role emotional	63.54±5.51	71.48±4.64	8.100	<0.001
Bodily pain	68.85±3.34	80.59±4.01	16.531	<0.001
Physical function	69.51±4.68	78.58±5.31	9.417	<0.001
General mental health	70.07±7.83	77.80±8.21	5.037	<0.001
Vitality	61.48±8.91	69.43±7.41	5.041	<0.001

Table 4. Comparison of muscle strength between the two groups before and after treatment

	Muscle strength grading before treatment			Muscle strength grading after treatment		
	Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4
Observation group	7	35	12	3	28	23
Control group	9	34	11	10	32	12
χ^2	0.308			7.493		
P	0.857			0.024		

The effects of clinically refreshing mind and spirit, alleviating mental depression and eliminating phlegm in traditional Chinese medicine can be achieved by stimulating the corresponding acupoints of the body by acupuncture. An animal model experiment has proved that the amount of sugar consumption as well as the horizontal and vertical activities of rats are increased by needling the acupoints of rats, and it has also confirmed that acupuncture can improve depressive status [18]. This study showed that the total effective rate of HAMD in the observation group was higher than that in the control group, and the SAS scores in the patients of observation group were more significantly decreased compared with that in the control group, similar to the previous research results [19].

Acupuncture is a commonly traditional Chinese medicine method for the treatment of post-stroke motor dysfunction. It regulates the central function through needling specific points of body, thus promoting the recovery of body muscle function and finally effectively improving the clinical symptoms of post-stroke motor dys-

function. Acupuncture can on the one hand improve physical compliance by strengthening muscle function, thus facilitating body movement. On the other hand, it can stimulate the nerves of limbs and trunk and thus raise the sensitivity. This study also confirmed that the myoelectric activity in the observation group was higher than that in the control group after acupuncture treatment, consistent with the previous results [20].

NIHSS serves as an important measure for evaluating nerve function, as well as an important reference for post-stroke treatment. The patients in this study received a certain improvement in recovering nervous system function with the relief of depression through acupuncture, thus reached an optimized treatment for the recovery of nervous system function in stroke. The degree of reduction of NIHSS scores in the observation group was significantly higher than that in the control group, confirming the research of acupuncture in the treatment of stroke and the previous research [21].

The Health-related Quality of Life Scale is the most reliable standard for evaluating quality of daily life of patients after stroke. The psychological negative emotions of the patients after acupuncture treatment were released to a certain extent, and the physical movement gained effective improvements, thus promoting the quality of daily life of the patients with post-stroke depression. This study showed that the QoL scores of the patients in the observation group after acupuncture treatment were obviously higher than those in the control group, confirming that acupuncture can significantly improve the QoL of the patients with post-stroke depression, consistent with the findings of a risk prediction model study [22].

However, the sample size in this study is small, and the side effects of related treatments need to be confirmed by further prospective random-

ized controlled studies with larger sample size. Moreover, the safety of acupuncture is also the focus of the future studies.

In summary, acupuncture can significantly alleviate the psychological negative emotions of patients with post-stroke depression and improve the physical rehabilitation after stroke, and can be used as a routine complementary treatment for stroke.

Disclosure of conflict of interest

None.

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