Observational Study

Medicine®

OPEN

Clinical observation of 60 cases of treating cognitive disorder after cerebral injury in combination with scalp acupuncture and cognitive training

Jinyu Du, MB*, Jiu Yin, MB, Lin Liu, MM, Jianlong Chen, MB, Mingchuan He, MB

Abstract

To observe the clinical effect of scalp acupuncture combined with cognitive training on cognitive disorder after cerebral injury.

Around 60 cases of cerebral injury patients for hospitalization in rehabilitation department of Chongqing Three Gorges Central Hospital from July in 2015 to June in 2017 are divided into control group and treatment group of 30 cases for each at random. The control group received routine treatment and cognitive rehabilitation training for 12 weeks. The treatment group received conventional treatment, cognitive rehabilitation training, and scalp acupuncture. Acupuncture with a scalp acupuncture is provided for the treatment group besides adopting above conventional treatment and rehabilitation training method.

Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) score of both groups increases obviously after treatment compared with that before treatment, and there is difference ($P < .01$) through contrast. And LOTCA score of treatment group is higher than that of control group ($P < .05$) after treatment.

Scalp acupuncture in combination with cognitive training can effectively improve cognitive disorder degree of patients with cerebral injury, and the effect is more significant compared with simple cognitive rehabilitation training, thus it is worth of research and application.

Abbreviations: LOTCA = Loewenstein Occupational Therapy Cognitive Assessment, MMSE = Mini-Mental State Examination.

Keywords: cognitive disorder, cognitive training, scalp acupuncture

1. Introduction

Traumatic cerebral injury and stroke have become the most common reason of current neural system injury. Brain trauma and stroke can both lead to a series of disorders of body, cognition, behavior, and feelings, Moreover, incidence rate of cognitive disorder is relatively high and its long-term influence on patients exceeds body disorder.[1] It is proved in researches that prevalence of cognitive disorder of brain trauma patients is 25% to 70%,[2] while that of stroke is 50% to 70%.[3–5] Cognitive impairment is an important factor affecting rehabilitation result of patients among all impairments. So rehabilitation of cognitive disorder has become a standard and an indispensable component[6] in rehabilitation of brain trauma and stroke. Researches on assessing and treating cognitive function of brain trauma promptly and accurately have become hot issues with disorder of cognitive function gradually focused by scholars and medical field.[7]

At present, there is a lack of special treatment for cognitive impairment after brain injury. Western medicine treatment of cognitive dysfunction includes drug therapy and cognitive rehabilitation training, both of which play a full role in improving cognitive function and promoting neuronal rehabilitation, and have been widely used in clinical practice. As early as 1980, nervous system-related diseases accounted for a large proportion of 43 kinds of acupuncture-moxibustion-related diseases publicly announced by the WHO. Many clinical studies have shown that acupuncture has a positive effect on the improvement of limb motor function after central nervous system injury, but there are few reports on whether acupuncture can improve cognitive impairment after brain injury. This study refers to Guidelines for clinical research methods of acupuncture and moxibustion (World Health Organization Western Pacific Regional Office, published in 1995), Using a randomized, controlled design clinical program, a comprehensive observation of acupuncture combined with cognitive rehabilitation training program to explore its clinical efficacy and impact on cognitive function in patients with brain injury, to provide practice for the promotion of this treatment method.

2. Methods

2.1. General data

This research took 60 cases of cerebral injury patients for hospitalization in rehabilitation department of Chongqing Three Gorges Central Hospital from July 2015 to June 2017 who is the

Editor: Massimo Tusconi.

The authors have no conflicts of interest to disclose.

Rehabilitation Department, Chongqing Three Gorges Central Hospital, Wanzhou, Chongqing, China.

* Correspondence: Jinyu Du, Rehabilitation Department, Chongqing Three Gorges Central Hospital, 366 Tiantai Road, Wanzhou, Chongqing, China (e-mail: qingshui1500@sina.com).

Medicine (2018) 97:40(e12420)

Received: 19 March 2018 / Accepted: 22 August 2018

http://dx.doi.org/10.1097/MD.0000000000012420

subject of this study. After the qualified subjects were identified, the cases were grouped by a random digital table method, that is, the researchers obtained 60 figures by using the check random number table. In a 1:1 ratio, they were sequentially grouped into one group and 2 groups. One or 2 cards were written into opaque envelopes and randomly distributed to the patients in the trial. One group was designated as the treatment group, and the second group was designated as the control group. There were 30 cases in each of the treatment group and the control group. The entire study was conducted with the informed consent of the patient and approved by the ethics committee of the hospital. There are 30 cases in treatment group with 20 males and 10 females. The average age is 40.63 ± 5.68 years old; the shortest disease course is 10 days, while the longest is half a year with average disease course of 4.85 ± 1.27 months; education years: 7 cases are under primary school ($\leq$6 years); 23 cases are junior high school graduate (>6 years); the Mini-Mental State Examination scale (MMSE)[8] scores: 14.57 ± 2.31. There are 30 cases in control group with 19 males and 11 females. The average age is 37.00 ± 7.25 years old; the shortest disease course is 15 days, while the longest is half a year with average disease course of 4.70 ± 1.43 months; education years: 9 cases are under primary school ($\leq$6 years); 21 cases are junior high school graduate (>6 years). MMSE score: 13.20 ± 2.78. There was no statistically significant difference between the 2 groups in terms of basic data and cognitive level before treatment ($P > .05$), which is comparable (Table 1).

2.2. Inclusion criteria

Conform to diagnostic criteria of traumatic brain injuries and cerebral apoplexy; there is cognition impairment in patients; there is causal relationship between disease and functional cognitive impairment; no gender limitation but selected age is between 18 years old and 70 years old; evaluated by MMSE; illiteracy < 17 scores; primary school graduate < 20 scores; junior high school graduate < 22 scores; college graduate < 24 scores can be included; informed consent of patients and their families.

2.3. Exclusion criteria

Patients with unstable disease state and disturbance of consciousness who do not cooperate with examination; patients who have serious aphasia or serious visual impairment or hearing disturbance; patients who conform to diagnosis of dementia made by American Association of Neurological Diseases; patients who have cognition impairment before onset of disease; patients who have serious heart, brain, kidney, and other organ function failure; patient who have obvious depression or patients who have personal case history of mental disorder.

Table 1

General clinical data of 2 groups of patients.

Item	Treatment group	Control group
Gender: (Male/Female)	30 (20/10)	30 (19/11)
Age (years)	40.63 ± 5.68	37.00 ± 7.25
Mean course of disease (month)	4.85 ± 1.27	4.70 ± 1.43
Education (below primary school/junior high school or above)	7/23	9/21
MMSE score	14.57 ± 2.31	13.20 ± 2.78

MMSE = Mini-Mental State Examination.

2.4. Basic treatment

Two groups were provided with routine medical treatments.[9] Drug treatment included antihypertensive, hypoglycemic, lipid lowering, elimination of cerebral edema, reduction of intracranial pressure, anti-infection, improvement of brain circulation, etc.; rehabilitation treatment according to the patient included physical treatment, occupational therapy, speech therapy and so on. At the same time, Citicoline Sodium Tablets (0.2 g oral 3 times a day) were given to improving brain cognitive function.

2.5. Control group

Control group was provided with targeted cognitive rehabilitation training for 12 weeks on the basis of conventional treatment (once per 40 minutes, once per day, and 5 days per week), and trained cognition problem includes attention disorder, disorientation, memory disorder, mental operation disorder and perceptual disorder (body composition disorder, spatial relationship disorder, agnosia, and apraxia). Training method includes one-to-one manual training and FlexTable training (produced by Guangzhou Zhanghe Electrical Equipment Co., Ltd.). Contents for manual training are mainly: over-painting graphics, memorizing card, classification matching, and memory calculation, etc. Main contents for FlexTable figure OT assessment and training system are item discrimination training, puzzle training, memory matrix training, fast matching training, classification cognitive training, color matching training, card memory training, attention coordination training, reactivity training, and classification picking training, etc.

2.6. Treatment group

On the basis of control group, treatment groups were provided with acupuncture of scalp acupuncture for 12 weeks (acupuncture were kept for 30 minutes, and it was conducted once per day and 5 days per week. According to International Standardization Program of scalp Acupuncture Nomenclature (World Health Organization Western Pacific Region, 1984), acupuncture parts are mainly parietal line mid, forehead line mid, line front of temporo, and back line of temporo.

2.7. Assessment methods

All patients shall be provided with cognitive function assessment at the usage of the 2nd version of Loewenstein Occupational Therapy Cognitive Assessment (LOTCA)[10] before and after treatment, including orientation ability (16 points), visual perception (16 points), spatial perception (16 points), action application (12 points), visual movement organization (12 points), mental operations (35 points) and attention (4 points).[11] The lowest point for all item scores is 1 point, and the highest score in different subitems is 4, 5, and 8 points, respectively. The total point is 119 points. Patients shall be provided with LOTCA assessment strictly by evaluator.

2.8. Statistical methods

Result of the research is analyzed by SPSS19.0. In the research, measurement data were expressed as $\overline{x} \pm s$, and variance analysis was used for comparison between groups; x^2 test was used for counting data. $P < .05$ indicates that the difference was statistically significant.

Table 2

Comparison of LOTCA scores between the 2 groups.

Group	Number of examples (n)	Total points	Orientation	Consciousness	Visual motion tissue	Thinking operation	Attention
Treatment group							
Before the course of treatment	30	63.71. ± 12.36	5.27 ± 1.26	28.73 ± 4.08	14.03 ± 3.76	13.30 ± 4.07	2.37 ± 0.67
After the course of treatment	30	87.97 ± 13.08*,†	7.27 ± 0.94*,†	37.93 ± 4.86*	21.57 ± 3.93*,†	17.67 ± 4.21*,†	3.53 ± 0.63*
Control group							
Before the course of treatment	30	60.77 ± 14.16	4.77 ± 1.43	29.73 ± 6.37	12.77 ± 3.99	11.03 ± 4.28b	2.47 ± 0.68
After the course of treatment	30	76.67 ± 14.44*	6.30 ± 1.18*	36.30 ± 5.11*	17.37 ± 4.30*	13.50 ± 5.12*	3.20 ± 0.71*

LOTCA = Loewenstein Occupational Therapy Cognitive Assessment.

* $P < .05$. Compared with the group before treatment.

† $P < .05$. Compared with the control group after treatment.

3. Results

It can be seen that LOTCA scores for 2 groups after treatment all significantly increase and the improvement were more obvious compared with those before treatment. Through statistics detection, comparison has significant difference ($P < .05$). The scores of LOTCA subitems in both groups were higher than those before treatment, and the difference was statistically significant ($P < .05$). In the 3 aspects of orientation, visual motor organization and thinking operation, the treatment group scores were higher than the control group, and the difference was statistically significant ($P < .05$). In terms of perception and attention, there was no statistical difference between the 2 groups ($P > .05$) (Table 2).

4. Discussion

In the early stages of rehabilitation of cerebral injury, people usually attached importance to the rehabilitation of physical function. But with lots of clinical practice, people found that it was not enough to only rehabilitate the physical function. In our country, the popularization and level of cognitive rehabilitation is far behind that of the developed counties such as America and Europe. Lots of rehabilitation agencies and rehabilitation departments only attach importance to the rehabilitation of limb function and language while cognitive rehabilitation has not been regarded as part of the neurological rehabilitation. Over 95% of rehabilitation agencies of developed countries provide cognitive rehabilitation service for the patient with cerebral injury.[6]

Cognitive disorder belongs to the scope of "dementia," "idiocy," and "forgetting" of Chinese traditional medicine. Seen from the meridian-collateral theory of Chinese traditional medicine, middle line of forehead, and parietal line mid belong to governor meridian and governor meridian belongs to cerebrum. It is pointed out in *Linshu· Hai Theory* that "cerebrum is the sea of marrow"; Li Shizhen of Ming Dynasty said "cerebrum is the house of mental activity," which clearly pointed out that the cerebrum is related to the mental activity. It is better for brain diseases to adopt the scalp acupuncture in Chinese medicine therapy. The scalp acupuncture commonly used middle line of vertex, middle line of forehead, anterior temporal line, and posterior temporal line are distributed in the scalp projection area of the parietal, frontal, and temporal lobes closely related to cognitive activities. Acupoints selection can be conducted in the corresponding scalp of the diseased region to adjust the cerebral cortex function, add partial cerebral blood flow of the focus, promote the collateral circulation and establishment in the area of cerebral necrosis, activate the nerve cells and nerve fibers of hypo-function in damaged main center and improve neurologic impairment due to hypoxia-ischemia of cerebral cells.[12]

A major difficulty in acupuncture research is the evaluation of the problem—how to quantify the effect? Because of its quantification of cognitive level, neuropsychology scale has become the most widely used evaluation tool in cognitive research. At present, many scales used to evaluate the overall cognitive function of patients at home and abroad including: Mini-Mental State Examination, Montreal Cognitive Assessment, Cognitive Capacity Screening Examination, Loewenstein Occupational Therapy Cognitive Assessment. Among them, the LOTCA scale evaluation project is comprehensive, with high reliability and validity, and is suitable for cognitive impairment assessment of brain injury.[13] Therefore, this study selected LOTCA as an evaluation tool.

In this study, LOTCA scores showed that after 12 weeks of treatment, the control group achieved recognized results, consistent with many studies. The LOTCA score was also significantly improved after treatment in the treatment group, and the effect was better than the control group. It shows that acupuncture combined with cognitive rehabilitation training has certain advantages in improving the cognitive function of patients, which deserves further study.

4.1. Study limitation

The limitations of this study mainly include 3 aspects: sample heterogeneity, sample capacity, and treatment bias.

Sample heterogeneity can have a certain degree of impact on the evaluation of acupuncture and training effects. The clinical complexity is that it is almost impossible to obtain a homogeneous sample clinically, and each patient has a difference in the damaged cognitive domain, which requires targeted acupuncture and cognitive training programs. Instead of looking for and comparing homogenous samples, the study reduced the complexity to simplicity and included both brain trauma and stroke because of the differences in the etiology and pathology of cognitive impairment. But the evaluation and treatment methods of clinical rehabilitation are roughly the same. We used MMSE as the primary screening scale to try to control the differences in cognitive baseline levels between the 2 groups of patients, and in fact reduced the effects of sample heterogeneity, it is also relatively objective to use the LOTCA test with high reliability and validity as the test standard.

At the beginning of the study, we planned to do about 200 patients. But in practice, we quickly found that the sample size was too difficult to obtain. The assessment and training process of cognition itself is complex and lengthy, and our energy and

funding cannot support large-scale research,[14] so this is only a little preliminary discussion, and we hope that in the future, if possible, to do multicenter, large sample research.

The acupuncture and rehabilitation training adopted in this study are individualized and suitable for human beings, so it is impossible to carry out double-blind randomized controlled trials, which may cause bias to some extent. In response to this problem, the study randomized the patients enrolled, and the functional assessment was performed by the same physician, and the physician was not involved in the treatment, which reduced the bias to some extent. In addition, individual differences, plasticity, participation, etc. all affect cognitive training effects.[15] Because of the condition, the analysis of related factors has not been carried out at present, which will be carried on in the future research experiment.

Author contributions

Conceptualization: Jinyu Du.
Data curation: Lin Liu, Mingchuan He.
Investigation: Lin Liu, Mingchuan He.
Methodology: Jinyu Du, Jiu Yin.
Project administration: Jinyu Du, Jianlong Chen.
Supervision: Jinyu Du, Jiu Yin, Jianlong Chen.
Validation: Jiu Yin.
Writing – original draft: Jinyu Du.
Writing – review & editing: Jinyu Du.
Jinyu Du orcid: 0000-0002-5337-1740

References

[1] Twamley EW, Jak AJ, Delis DC, et al. Cognitive symptom management and rehabilitation therapy (CogSMART) for veterans with traumatic brain injury: pilot randomizd controlled trial. J Rehabil Res Dev 2014;51:59–70.

[2] Vaishnavi S, Rao V, Fann JR. Neuropsychiatric problems after traumatic brain injury: unraveling the silent epidemic. Psychosomatics 2009;50: 198–205.

[3] Hachinski V, Iadecola C, Petersen RC, et al. National Institute of Neurological Disorders and Stroke—Canadian Stroke Net-work vascular cognitive impairment harmonization standards. Stroke 2006;37: 2220–41.

[4] Hachinski V, Munoz D. Vascular factors in cognitive impairment: where are we now? Ann N Y Acad Sci 2000;903:1–5.

[5] Desmond DW, Moroney JT, Paik MC, et al. Frequency and clinical determinants of dementia after ischemic stroke. Neurology 2000;54: 1124–31.

[6] Yun Xiao-ping. Cognitive rehabilitation based on research evidence. Chin J Rehabil Theory Pract 2011;17:512–4.

[7] Jin YP, Di Legge S, Ostbye T, et al. The reciprocal risks of stroke and cognitive impairment in an elderly population. Alzheimer's & Dementia 2006;2:171–8.

[8] Folstien MF, Folstien SE, McHugh PR. Mini-Mental State: a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–98.

[9] Yan T, Hui-Chan CW, Li LS. Functional electrical stimulation improves motor recovery of the lower extremity and walking ability of subjects with first acute stroke: a randomized placebo-controlled trial. Stroke 2005;36:80–5.

[10] Yun Xiao-ping. Application of the Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) battery in Chinese version. Chin J Rehabil Theory Pract 1999;5:110–4.

[11] Yan Tie-bin MA, Chao GUO, You-hua , et al. Validity and reliability of the simplified Chinese version of Loewenstein Occupational Therapy Cognitive Assessment. Chin J Phys Med Rehabil 2004;26:81–4.

[12] Xie Dong-ling, Zhu Li-fang, Liu Hui-yu, et al. The effects of scalp acupuncture on cognitive function of patients with stroke. Chin J Rehabil Med 2007;22:835.

[13] Zhang Shangang, Fan Jianzhong, Chen Pingyan. A preliminary study on the reliability and internal validity of Lo Winston's occupational therapy cognitive assessment Chinese scale. Chin J Phys Med Rehabil 2004; 26:530–4.

[14] Lorig K. Chronic disease self-management: a model for tertiary prevention. Kango Kenkyu 1998;31:23–9.

[15] Jean L, Simard M, Wiederkehr S, et al. Efficacy of a cognitive training programme for mild cognitive impairment: results of a randomised controlled study. Neuropsychol Rehabil 2010;20:377–405.