

Research progress on acupuncture therapy for spastic hemiplegia after ischemic stroke

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Abstract. Spastic hemiplegia is a common clinical condition in patients with ischemic stroke, which has a significant impact on their motor function and quality of life. A large number of clinical studies have shown that acupuncture has significant advantages in treating spastic hemiplegia after stroke, and it is worth further promoting and applying in clinical practice due to its simple operation, high safety, and mild side effects. The commonly used clinical methods for acupuncture therapy of spastic hemiplegia after ischemic stroke include filiform needle therapy, electroacupuncture therapy, fire needle therapy, warm needle therapy, and other different acupuncture methods and acupoint selection methods, which can promote the recovery of limb motor function in patients. However, there is currently no clear international standardized treatment plan for acupuncture therapy. In the future, we should strengthen the rigor of clinical practice and research, and strive to contribute to the improvement of the quality of life of stroke patients.

Keywords: ischemic stroke, spastic hemiplegia, acupuncture therapy, review

1. Introduction

Ischemic stroke is an acute cerebrovascular disease caused by cerebral ischemia, hypoxia, necrosis, softening, and the formation of infarction due to cerebral blood supply disorders, with cerebral thrombosis being a common cause. The main clinical manifestations include sudden facial and eye deviation, hemiplegia, dysarthria, and even sudden loss of consciousness [1]. Spastic hemiplegia commonly occurs in patients after ischemic stroke, characterized by increased muscle tension, stiffening of limbs, and difficulty or inability to perform fine movements, significantly impacting patients' motor functions and daily life quality. Therefore, rational rehabilitation treatments during the stroke recovery phase to alleviate spasticity, promote isolated movement, hasten motor function recovery, improve daily life quality, and facilitate patients' return to society are crucial. In recent years, the advantages of acupuncture therapy for spastic hemiplegia post-ischemic stroke have been demonstrated in various literature. As acupuncture therapy is a safe, cost-effective, and minimally side-effect treatment modality, it has gained significant attention in clinical medicine. Thus, a specific investigation into its clinical application progress is necessary. This review aims to comprehensively summarize the research on

acupuncture therapy for spastic hemiplegia after ischemic stroke to provide a more comprehensive perspective and basis for clinical treatment.

2. Overview of Spastic Hemiplegia after Stroke

2.1. Etiology and Pathogenesis

In traditional Chinese medicine, the causes of stroke mainly involve wind, fire, phlegm, stasis, and deficiency, with the pathogenesis indicating deficiency within manifestation. Liver and kidney deficiency leads to inadequate water containment by wood, resulting in liver yang hyperactivity transforming into wind and causing internal movement of wind and yang, stasis obstructing cerebral vessels, leading to brain damage, and loss of normal brain function, thus causing a stroke [2]. Spastic hemiplegia after a stroke results from the combination of various pathological factors such as phlegm, stasis, deficiency, and wind. Stroke patients exhibit deficiency in the body's righteous qi, leading to inadequate circulation of qi, blood, and body fluid, resulting in poor nourishment of the meridians in the limbs, leading to clinical symptoms of contraction and deformation.

2.2. Principles and Methods of Acupuncture Therapy

Clinical research indicates that acupuncture, as a traditional Chinese medical treatment, demonstrates significant therapeutic effects on stroke patients. It helps prevent and intervene in the secondary damage after a stroke by controlling inflammatory reactions, inhibiting cell apoptosis, improving intracranial circulation, and reshaping neurovascular units [3]. Acupuncture therapy presents advantages such as simplicity, minimal side effects, and good efficacy, leading to its increasing application in stroke treatment. In the sequelae period after a stroke, early intervention with acupuncture therapy is preferred when the patient's vital signs stabilize [4]. For spastic hemiplegia, the primary treatment principles of acupuncture therapy involve nourishing the liver and kidneys, promoting meridian circulation, and enhancing righteous qi to activate blood circulation, thereby effectively improving the spasticity of hemiplegia.

3. Filiform Needle Therapy

Filiform needle therapy is one of the principal and most commonly used therapies in traditional Chinese acupuncture. It involves using filiform needles to perform specific acupuncture techniques on the body's meridian acupoints, aiming to regulate the viscera meridians and harmonize the nutrient-protective qi and blood, thus treating diseases. Based on the selection of acupoints for filiform needle therapy, it can be further divided into specific therapies such as head needle therapy, body needle therapy, eye needle therapy, and abdominal needle therapy [5].

3.1. Head Needle Therapy

Head needle therapy involves using filiform needles to stimulate specific areas of the scalp and certain locations, creating muscle and nerve stimulation under the scalp tissue. This method aims to prevent and treat diseases through acupuncture. Apart from traditional meridian acupoints, international standard head needle therapy further divides the human head into various regions based on cortical functional localization. Four standardized head needle lines were developed in four regions: frontal, parietal, temporal, and occipital regions, widely applied in clinical practices [6]. Studies by Yang Chenxi et al. [7] randomized 72 ischemic stroke patients into control and treatment groups. The control group received traditional acupuncture combined with head needle therapy, while the treatment group used Guan needle method combined with head needle therapy. Results showed a significant decrease in the upper limb's improved Ashworth scale after treatment in both groups, but the treatment group had notably better overall efficacy, effectively relieving spastic hemiplegia and improving motor ability in ischemic stroke patients. In another study by Zhang Shanshan [8], scalp-encircling needle therapy effectively improved spasms in the affected upper limbs of patients with a deficiency of qi and blood caused by stroke, aiding brain neurofunctional recovery and enhancing patient mobility. Additionally,

Yang Fengnan's [9] research on 72 post-ischemic stroke spastic hemiplegic patients demonstrated that combining neural-muscular electrical stimulation with head needle therapy significantly reduced lower limb muscle tension and spasticity compared to the control group, promoting limb motor function recovery. Furthermore, Zhang Wei et al. [10] explored the effect of interactive head needle therapy on spastic hemiplegia after stroke in 82 patients. The results demonstrated significantly higher scores in balance, motor function, and daily life ability in the observation group compared to the control group, indicating that interactive head needle therapy can alleviate spasticity and improve balance and motor skills in stroke patients, possibly related to increased neural factors and nerve repair.

3.2. Body Needle Therapy

Body needle therapy involves selecting human meridians or extraordinary acupoints based on traditional Chinese medical theory and using acupuncture to achieve therapeutic goals through stimulation. Yang Pan [11] utilized the Wake-up Brain and Open-up Acupoint Needle method established by Academician Shi Xuemin to treat post-stroke spastic hemiplegia patients, resulting in substantial improvement in neurological and motor functions compared to conventional rehabilitation treatments. Wang Xinwei et al. [12] investigated the efficacy of Wang's "Hand-Foot Twelve Needles" therapy, showing significant improvement in muscle strength and motor function in the affected limbs of stroke patients with qi deficiency and blood stasis compared to basic treatment and rehabilitation training. Similarly, Wang Jian's [13] study using the channel-clearing and spasm-relieving needle method, focusing on specific acupuncture points of the affected upper limb in post-stroke patients, combined with basic rehabilitation training, showed positive improvement in spastic paralysis of the upper limbs after stroke.

3.3. Eye Needle Therapy

Eye needle therapy involves focusing on utilizing acupoints around the eyes as the primary local lesion sites for needle insertion to achieve therapeutic goals. In a study by Liu Xiaoyu et al. [14], a trial group received eye needle therapy combined with Dajejing method on the basis of rehabilitation for post-stroke spasticity in the lower limbs, while the control group underwent standard rehabilitation treatment alone. Results after four weeks indicated superior evaluation outcomes in the trial group compared to the control, suggesting effective improvement in lower limb spasticity and enhanced lower limb motor function, further enhancing the quality of life in post-stroke limb dysfunction patients. Meng Jian's research [15] incorporated Juci method with eye needle therapy to improve muscle spasms in post-stroke hemiplegic patients, demonstrating a total effective rate of 91.67% in the trial group compared to the two control groups, indicating that this combined therapy effectively enhances motor function in post-stroke hemiplegic patients, promoting neuroplasticity. Additionally, Xu Hanfang et al. [16] conducted a study involving 60 post-stroke hemiplegic patients, randomly dividing them into a control group receiving conventional acupuncture and rehabilitation training and a treatment group receiving eye needle therapy in addition to the control group's treatment. The treatment group's total effective rate was 96.7%, higher than the control group's 86.7%, validating the significant efficacy of eye needle therapy in alleviating post-stroke spastic hemiplegia.

3.4. Abdominal Needle Therapy

Abdominal needle therapy involves selecting specific abdominal acupoints for needle insertion. Modern TCM studies have indicated that abdominal acupuncture has the effects of strengthening qi, invigorating the spleen, guiding qi to the origin, supplementing the kidney and essence, and balancing visceral yin and yang. In a study by Jin Lingqing et al. [17], post-stroke spastic hemiplegic patients were divided into a control group receiving exercise therapy and an observation group receiving combined abdominal needle therapy with acupuncture on the back-shu points. After eight weeks, the observation group showed more significant improvements in spasticity assessed by the Ashworth scale and a more notable increase in quality of life assessed by the Barthel index compared to the control group. Changes in glutamic acid and gamma-aminobutyric acid levels were more pronounced in the observation group, indicating that abdominal needle therapy combined with exercise therapy effectively reduces spasticity

in post-stroke patients, enhances quality of life, and restores the balance of excitatory and inhibitory neurotransmitters. Wu Lirong et al. [18] applied abdominal needle therapy combined with Du Meridian moxibustion in post-stroke patients with spastic paralysis, achieving a total effective rate of 86.7%. This suggests that this combined therapy effectively reduces limb muscle tension, improves limb spasticity, and enhances daily life abilities, playing a positive role in stroke patient rehabilitation.

4. Electroacupuncture

Electroacupuncture involves inserting needles into acupoints and stimulating them with a minute electric current that elicits a sensation, aiming to treat diseases. The types of electric waveforms include continuous, intermittent, and sparse-dense waves. Zhang Jianbo et al. [19] employed electroacupuncture treatment in post-stroke upper limb spasticity patients, focusing on simultaneous electroacupuncture antagonizing muscle and active muscle. The evaluation after four weeks showed a decrease in muscle tension scores for the elbow and wrist flexor muscles and an increase in upper limb Fugl-Meyer scores, indicating that electroacupuncture can alleviate spasticity in post-stroke upper limb patients, thereby accelerating the recovery of motor function. Additionally, Sheng Guobin et al. [20] studied the clinical efficacy of electroacupuncture in acupuncture points along the elbow meridians in post-stroke patients. After 28 days of treatment, the total effective rate in the treatment group was 95%, demonstrating that this method enhances elbow joint mobility and effectively reduces upper limb muscle tension and improves motor function. Furthermore, Zhao Juanjuan et al. [21] conducted a randomized grouping of stroke patients, comparing drug treatment in the control group with observation group participants receiving combined traditional Chinese medicine fumigation and electroacupuncture. The observation group showed lower root mean square values in surface electromyography and lower electromyography values for the anterior tibial muscle, along with a higher overall effective rate compared to the control group.

5. Heat Needle Therapy

Heat needle therapy, also known as "burning needle" or "cauterization" in ancient traditional Chinese medicine, involves heating the tip of the needle until it turns red in a flame and swiftly inserting it into the patient's body surface, aiming to warm the meridians, dispel pathogenic factors, and scatter coldness. This method, due to its intense stimulation, is not suitable for individuals with a heat syndrome, malignancies, pregnant women, or the elderly and weak. Hou Xinlei et al. [22] employed heat needle therapy combined with embedding thread in acupoints for post-stroke upper limb spasticity patients, with clinical results demonstrating a significant reduction in spasticity and a notable improvement in motor function. Wu Mingde [23] divided 65 post-stroke hemiplegic patients into a research group and a control group. Both groups underwent routine rehabilitation treatment, with the research group receiving additional heat needle therapy for 40 days. The results showed a lower degree of muscle spasm on the affected side in the research group compared to the control, and a better muscle strength level, indicating that the combination of modern rehabilitation techniques and traditional heat needle therapy can alleviate muscle spasms in post-stroke hemiplegic patients and improve muscle strength and limb motor function recovery. Liu Jun et al. [24] conducted a clinical trial on post-stroke spastic paralysis patients, randomly assigning subjects to a conventional acupuncture group and a heat needle group. After 28 days of continuous treatment, the overall effective rate in the heat needle group reached 83.3%, significantly higher than the conventional acupuncture group's 61.1%, demonstrating the notable efficacy of heat needle acupuncture in treating post-stroke limb spastic paralysis through needle insertion at specific acupoints.

6. Warm Needle Therapy

Warm needle therapy, a traditional Chinese medical treatment dating back to the Eastern Han Dynasty, involves inserting fine needles into acupoints and igniting short moxa sticks or moxa cones at the needle base to transmit heat energy into the body, aiming to prevent and treat diseases. This therapy promotes qi circulation, activates blood circulation, and disperses coldness. It is relatively gentle and widely

applied in clinical settings. Han Zhenxiang et al. [25] observed 90 cases of post-stroke spastic hemiplegia patients. The combination of Guan needle therapy and modern rehabilitation techniques showed favorable improvements in the upper limb spasticity of post-stroke hemiplegic patients, further enhancing limb function recovery. Wang Ying [26] conducted a clinical randomized controlled trial to evaluate the efficacy of warm needle therapy in post-stroke spastic hemiplegia. The evaluation results after treatment showed that warm needle therapy was more effective in treating spasticity in post-stroke hemiplegia compared to traditional acupuncture. Yin Guodao [27] randomized 72 post-stroke spastic hemiplegia patients into a control group and an observation group. The observation group received warm needle acupuncture in addition to routine treatment. The results demonstrated that warm needle acupuncture had a more significant clinical effect on post-stroke spastic hemiplegia compared to conventional rehabilitation training alone. Warm needle acupuncture effectively alleviated spasticity in stroke patients, leading to noticeable improvements in limb motor function and enhancing the patients' quality of daily life.

7. Conclusion

In the treatment of post-ischemic stroke spastic hemiplegia, acupuncture exhibits unique clinical advantages with various needle techniques and acupoint methods. However, there is currently no unified standard or protocol for the treatment of post-stroke spastic hemiplegia, leading to a considerable reliance on the subjective judgment of physicians during treatment, which may result in inconsistent treatment efficacy. Additionally, in clinical trials of various acupuncture methods, achieving true double-blind conditions is often challenging, potentially leading to a certain degree of bias in research results. Nevertheless, supported by a wealth of clinical trial data, acupuncture therapy has demonstrated real and reliable efficacy in treating post-ischemic stroke spastic hemiplegia. In future clinical practice and research, efforts should be made to promote the application of acupuncture therapy, while aiming to establish standardized and unified treatment protocols and guidelines as early as possible. Further research should focus on enhancing rigor and striving to contribute to improving the quality of life for post-stroke patients.

References

- [1] Wei Shanyao, Zhang Yongquan, Zhang Yi, Lan Shile, Wang Jianchao. Research Progress of Traditional Chinese Medicine Treatment for Post-Stroke Spastic Hemiplegia in the Past Five Years[J]. Chinese Journal of Traditional Chinese Medicine and Clinical Pharmacology, 2020, 32(09): 1619-1622. DOI: 10.16448/j.cjtc.2020.0905.
- [2] Huo Pingxu. Research Progress of Traditional Chinese Medicine in the Treatment of Post-Stroke Spastic Hemiplegia[J]. Inner Mongolia Traditional Chinese Medicine, 2022, 41(12): 157-159. DOI: 10.16040/j.cnki.cn15-1101.2022.12.063.
- [3] Tang Qiang, Zhang Shiqiang, Yin Xia, et al. Rehabilitation Mechanism of Zhenkang Method in the Treatment of Stroke: A Research Progress[J]. China Medicine Guide, 2022, 19(28): 37-40. DOI: 10.20047/j.issn1673-7210.2022.28.07.
- [4] Yin Chunsheng, Zhang Chao, Meng Xianggang, et al. Research Status of Quantity and Time Effect of Acupuncture Treatment for Stroke[J]. Shanghai Journal of Acupuncture and Moxibustion, 2022, 41(08): 824-830. DOI: 10.13460/j.issn.1005-0957.2022.08.0824.
- [5] Chen Mengling, Tang Chenglin, Zhou Ping, et al. Research Progress of Acupuncture Treatment of Ischemic Stroke[J]. Journal of Practical Traditional Chinese Medicine, 2023, 39(04): 820-823.
- [6] Chen Fei, Xu Jing, Liu Fanfan, Guo Cuiying. Clinical Research Progress of Head Needle Combined Therapy for Limb Motor Dysfunction in Patients with Cerebral Infarction[J]. Chinese Journal of Traditional Chinese Medicine and Clinical Pharmacology, 2020, 32(09): 1623-1626. DOI: 10.16448/j.cjtc.2020.0906.

- [7] Yang Chenxi, Zhang Wendong, Yang Yiping, et al. Clinical Study of Guan Needle Method Combined with Head Needle Treatment for Post-Stroke Upper Limb Spastic Hemiplegia[J]. Journal of Chinese Medicine, 2023, 51(04): 67-73. DOI: 10.19664/j.cnki.1002-2392.230082.
- [8] Zhang Shanshan. Clinical Observation of Scalp Perimeter Needle in the Treatment of Qi Deficiency and Blood Stasis Type Post-Stroke Spastic Hemiplegia [D]. Guangzhou University of Traditional Chinese Medicine, 2021. DOI: 10.27044/d.cnki.ggzuz.2021.000300.
- [9] Yang Fengnan. Effect of Neuromuscular Electrical Stimulation Combined with Head Needle on Lower Limb Muscle Tone in Patients with Ischemic Stroke Spastic Hemiplegia[J]. Practical Clinical Medicine of Integrated Traditional Chinese and Western Medicine, 2021, 21(11): 102-103. DOI: 10.13638/j.issn.1671-4040.2021.11.051.
- [10] Zhang Wei, Ding Mingjun, Geng Luona. Influence of Interactive Head Needle on Balance Ability and Motor Function of Patients with Post-Stroke Spastic Hemiplegia[J]. Shaanxi Journal of Traditional Chinese Medicine, 2021, 42(01): 115-117.
- [11] Yang Pan. Effect of Awakening and Brain-Opening Needle Method on Post-Stroke Spastic Hemiplegia[J]. Practical Clinical Medicine of Integrated Traditional Chinese and Western Medicine, 2020, 20(03): 151-153. DOI: 10.13638/j.issn.1671-4040.2020.03.079.
- [12] Wang Xinwei, Zhang Hu, Ding Xiao, Yang Yang, Yang Xiaowei. Effect of "Hand and Foot Twelve Needles" on Quality of Life of Patients with Qi Deficiency and Blood Stasis Syndrome in the Recovery Period of Cerebral Infarction[J]. World Journal of Integrated Traditional and Western Medicine, 2020, 15(09): 1684-1687. DOI: 10.13935/j.cnki.sjzx.200925.
- [13] Wang Jian, Bao Yongxin, Xiang Yongmei, et al. Clinical Observation of Tongjing Jiejing Needling Combined with Rehabilitation Training in the Treatment of Post-Stroke Upper Limb Spastic Paralysis[J]. Journal of Modern Integrated Traditional Chinese and Western Medicine, 2018, 27(07): 699-702.
- [14] Liu Xiaoyu, Shao Yan, Wang Pengqin. Clinical Efficacy Evaluation of Eye Needle Therapy Combined with Dajiejing Method in the Treatment of Post-Stroke Lower Limb Spasticity[J]. Journal of Liaoning University of Traditional Chinese Medicine, 2022, 24(06): 136-140. DOI: 10.13194/j.issn.1673-842x.2022.06.030.
- [15] Meng Jian, Liu Guanghui. Evaluation of the Effectiveness of Juci Method Combined with Eye Needle Therapy in the Treatment of Post-Stroke Paralysis[J]. Journal of Liaoning University of Traditional Chinese Medicine, 2020, 22(09): 191-194. DOI: 10.13194/j.issn.1673-842x.2020.09.046.
- [16] Xu Hanfang, Bai Qiang. Clinical Observation of Eye Needle Therapy in the Treatment of Post-Stroke Spastic Hemiplegia[J]. Bright Traditional Chinese Medicine, 2018, 33(03): 339-341.
- [17] Jin Lingqing, Lang Boxu, Chang Sheng. Observation on the Effect of Abdominal Needle Combined with Exercise Therapy on the Efficacy and Glu and GABA Levels in Post-Stroke Spastic Hemiplegia[J]. Chinese Journal of Traditional Chinese Medicine and Technology, 2021, 28(06): 921-923.
- [18] Wu Lirong, Nong Fengguan, Deng Changheng. Clinical Observation of Abdominal Needle Combined with Du Meridian Moxibustion in the Treatment of Post-Stroke Spastic Paralysis[J]. New Traditional Chinese Medicine, 2017, 49(04): 137-139. DOI: 10.13457/j.cnki.jncm.2017.04.048.
- [19] Zhang Jianbo, Wei Ruipeng, Yang Hong, et al. Influence of Simultaneous Electroacupuncture Antagonizing Muscles and Active Muscles on Motor Function in Patients with Post-Stroke Upper Limb Spasticity[J]. Chinese Acupuncture, 2022, 42(04): 381-384. DOI: 10.13703/j.0255-2930.20210406-k0001.
- [20] Sheng Guobin, Xue Ruidong, Cai Yumei, et al. Influence of Electrical Needle at Elbow Meridian Nodes on Elbow Joint Range of Motion in Post-Stroke Spastic Period[J]. Chinese Medicine Information, 2022, 39(02): 64-68. DOI: 10.19656/j.cnki.1002-2406.20220212.

- [21] Zhao Juanjuan. Clinical Study of Traditional Chinese Medicine Fumigation Combined with Electroacupuncture in the Treatment of Post-Stroke Lower Limb Spasticity[J]. Journal of Practical Traditional Chinese Medicine, 2020, 36(12): 1532-1533.
- [22] Hou Xinlei, Jin Ze, Shang Weimin, et al. Influence of Fire Needle Combined with Embedding Thread on Spasm Degree and Upper Limb Motor Function in Patients with Post-Stroke Upper Limb Spasm[J]. Tianjin Traditional Chinese Medicine, 2022, 39(01): 58-62.
- [23] Wu Mingde. Effect of Moxibustion Combined with Modern Rehabilitation Technology on Limb Function and Daily Life Ability of Patients with Post-Stroke Hemiplegia[J]. Clinical Research of Traditional Chinese Medicine, 2021, 13(34): 68-70.
- [24] Liu Jun, Zhou Hongfei, Zhan Guoce, et al. Clinical Observation of Fire Needle Acupuncture on Spastic Paralysis After Stroke[J]. Journal of Liaoning University of Traditional Chinese Medicine, 2022, 24(04): 7-10. DOI: 10.13194/j.issn.1673-842x.2022.04.002.
- [25] Han Zhenxiang, Qi Lili, Chu Lixi, et al. Clinical Observation of Guan Needle and Warm Needle Combined with Easy Transformation Technique in the Treatment of Ischemic Stroke Spastic Hemiplegia[J]. Chinese Journal of Rehabilitation Medicine, 2018, 33(10): 1190-1193.
- [26] Wang Ying. Observation on the Efficacy of Warm Needle Therapy in the Treatment of Post-Stroke Spastic Hemiplegia in 30 Cases[J]. Yunnan Journal of Traditional Chinese Medicine, 2016, 37(08): 70-71. DOI: 10.16254/j.cnki.53-1120/r.2016.08.034.
- [27] Yin Guodao. Improvement Effect of Warm Needle Moxibustion on Motor Function of Patients with Post-Stroke Spastic Hemiplegia[J]. Clinical Research of Traditional Chinese Medicine, 2021, 13(17): 71-73.