

Research Progress in Acupuncture-Assisted Rehabilitation for Post-Stroke Hemiplegia

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Abstract: *Post-stroke hemiplegia is one of the most common and typical functional impairments after stroke. It is mainly characterized by reduced motor function of the affected limbs, impaired gait and balance, and limitations in activities of daily living, thereby exerting a profound impact on prognosis and quality of life. In recent years, acupuncture-assisted rehabilitation, a comprehensive treatment approach combining acupuncture with modern rehabilitation training, has attracted increasing attention in the rehabilitation of post-stroke hemiplegia. During acupuncture needle retention, patients perform active movement, task-oriented training, gait training, and balance training simultaneously, which may activate a synergistic mechanism of “acupuncture stimulation–sensory feedback–motor learning–central nervous system remodeling,” thereby promoting neurological recovery and motor functional reconstruction. Existing evidence suggests that acupuncture-assisted rehabilitation has favorable effects in improving limb motor function, promoting gait and balance recovery, alleviating spasticity, and improving swallowing function. This review summarizes recent domestic clinical applications, characteristics of different acupuncture methods, and mechanistic studies related to acupuncture-assisted rehabilitation for post-stroke hemiplegia over the past five years, with the aim of providing a practical reference for standardized clinical application.*

Keywords: Acupuncture-assisted rehabilitation, Acupuncture-movement therapy, Post-stroke hemiplegia, Stroke.

1. Introduction

Stroke is characterized by high incidence, high disability, and high recurrence rates, and remains a major cause of adult disability in China. Post-stroke hemiplegia, as the most common sequela of stroke, often results in decreased muscle strength, impaired coordination, spasticity, abnormal gait, and balance dysfunction, severely affecting patients' independence and social participation. With population aging and the increasing number of stroke cases, how to more effectively promote functional recovery during the post-stroke rehabilitation window has become an important clinical issue.

Modern rehabilitation medicine emphasizes early intervention, repetitive training, and active participation. However, in clinical practice, many patients fail to achieve optimal outcomes because of limited function, poor adherence to rehabilitation, or insufficient rehabilitation resources. Acupuncture has long been used in the treatment of post-stroke hemiplegia in traditional Chinese medicine. In recent years, acupuncture-assisted rehabilitation has emerged as a treatment model in which acupuncture and rehabilitation training are implemented simultaneously. This approach integrates the meridian-regulating and qi-activating effects of acupuncture with the functional reconstruction advantages of rehabilitation training, and may facilitate neuroplasticity, enhance sensory-motor feedback, and improve motor learning efficiency. Relevant technical standards, research progress, and theoretical discussions have provided a basis for its clinical application [1–5].

2. Clinical Research Progress

2.1 Eye-Acupuncture-Assisted Rehabilitation

Eye-acupuncture-assisted rehabilitation is one of the most widely studied forms of acupuncture-assisted rehabilitation.

Existing studies have shown that this therapy has clinical value in post-stroke upper limb dysfunction, dysphagia, shoulder-hand syndrome, and gait dysfunction [6–12]. Mu Kaijin et al. conducted a clinical study on eye-acupuncture-assisted rehabilitation for post-stroke upper limb dysfunction and found that it could improve motor function of the affected limb [6]. Ding Siyuan further explored its clinical effects and angiogenesis-related mechanisms, suggesting that it may promote neurological repair and angiogenesis [7]. Wang Heyi also reported that eye-acupuncture-assisted rehabilitation had a positive effect on motor recovery in ischemic stroke, supporting the proposed mechanism [8].

In terms of functional impairment, Tang Zijian confirmed that eye-acupuncture-assisted rehabilitation could effectively improve upper limb dysfunction after stroke [9]. Jia Linlin applied this therapy to post-stroke dysphagia and found improvements in swallowing function [10]. Liu Tong reported beneficial effects on clinical symptoms and function in patients with stage I shoulder-hand syndrome after stroke [11]. Wang Anran further applied this therapy to gait dysfunction after stroke and observed improvements in gait and lower limb motor function [12]. Overall, eye-acupuncture-assisted rehabilitation appears to be applicable to multiple post-stroke functional deficits.

2.2 Scalp-Acupuncture-Assisted Rehabilitation

Scalp-acupuncture-assisted rehabilitation combines scalp acupuncture with rehabilitation training to enhance sensory-motor integration in the central nervous system. Hu Ruifeng et al. reported that rehabilitation training during scalp acupuncture retention could be applied in patients with stage I–II shoulder-hand syndrome after stroke and achieved favorable outcomes in local functional recovery [13]. Yang Shuangying et al. further investigated the efficacy and time dependence of scalp-acupuncture-assisted rehabilitation for hand dysfunction after stroke, suggesting that synchronous

training during needle retention may improve therapeutic effects [14]. Yao Rujie et al. also found that scalp-acupuncture-assisted rehabilitation combined with rehabilitation training had a positive effect on upper limb dysfunction after stroke [15].

Compared with conventional acupuncture, scalp – acupuncture - assisted rehabilitation emphasizes synchronous functional training under acupuncture stimulation, which may enhance motor input and sensory feedback from the affected limb. Therefore, it may have advantages in upper limb fine motor control, postural stability, and functional reconstruction.

2.3 Tongdu-Tiaoshen Acupuncture Combined with Rehabilitation

Tongdu-Tiaoshen acupuncture emphasizes “entering the brain via the Governor Vessel and regulating the spirit,” which is consistent with the traditional Chinese medicine pathogenesis of post-stroke hemiplegia, namely “brain-spirit dysregulation and meridian obstruction.” Liu Liang and Liu Quan combined Tongdu-Tiaoshen acupuncture with modified Fuzheng Huoxue Decoction for patients with qi deficiency and blood stasis-type post-stroke hemiplegia, and reported improvements in neurological function, motor function, and quality of life [16]. Zhang Junyu et al. further demonstrated that Tongdu-Tiaoshen acupuncture combined with rehabilitation training promoted recovery of lower limb motor function after ischemic stroke [17]. Xu Fanfeng also confirmed the value of Tongdu-Tiaoshen acupuncture in improving motor dysfunction in patients with ischemic stroke [18].

Clinically, Tongdu-Tiaoshen acupuncture may be more suitable for patients with severe motor dysfunction, prolonged recovery, or complications such as spasticity and gait abnormalities. Its advantage lies in combining brain-awakening and meridian-unblocking effects, thereby meeting the holistic needs of post-stroke neurological recovery.

2.4 Xingnao Kaiqiao Acupuncture Combined with Rehabilitation

Xingnao Kaiqiao acupuncture is one of the most widely used classical acupuncture methods in post-stroke rehabilitation. Qian Yue et al. found that Xingnao Kaiqiao acupuncture could improve the corticospinal tract and motor function in patients with ischemic stroke [19]. Yao Yinan investigated the clinical efficacy of Xingnao Kaiqiao acupuncture combined with motor acupuncture in patients with post-stroke spastic hemiplegia, and the results showed significant improvement in upper limb spasticity and motor dysfunction [20].

Furthermore, Li Shipeng et al. used Xingnao Kaiqiao acupuncture combined with core stability training and found improvements in balance ability and lower limb motor function in patients with post-stroke hemiplegia [21]. Tian Ran et al. applied Xingshen Tongjing Daqi acupuncture combined with task-oriented training to patients with post-stroke hemiplegia and observed positive effects on motor function recovery [22]. Zheng Hebin et al. reported that Xingshen Qibi acupuncture combined with motor therapy had

favorable effects on limb dysfunction after stroke [23]. Ma Haibin et al. further demonstrated that Xingnao Kaiqiao acupuncture combined with motor relearning therapy improved lower limb motor function in patients with post-stroke hemiplegia [24]. These studies suggest that Xingnao Kaiqiao-related acupuncture not only has therapeutic value on its own but also complements various modern rehabilitation techniques.

2.5 Motor Acupuncture and Acupuncture-Movement Therapy

Motor acupuncture is an important component of acupuncture-assisted rehabilitation. Its main feature is that active movement of the affected limb is performed immediately after acupuncture deqi, thereby enhancing the synergy between acupuncture and functional training. Ma Shuang et al. reported that motor acupuncture significantly improved lower limb motor function and gait in patients with post-stroke hemiplegia [25]. Xie Qing et al. combined motor acupuncture with functional electrical stimulation in patients with post-stroke hand dysfunction and found further improvement in hand function recovery [26].

Li Yan et al. reported that motor imagery therapy combined with acupuncture-movement therapy promoted upper limb recovery in patients with post-stroke hemiplegia [27]. Li Qiang et al. investigated the effects of acupuncture combined with motor therapy on early motor rehabilitation after ischemic stroke using transcranial magnetic stimulation - induced motor evoked potentials, suggesting that the combined approach may promote reconstruction of neural conduction pathways [28]. Qiu Siming also observed favorable outcomes of acupuncture-movement therapy in patients with post-stroke hemiplegia [29]. Xu Yuan et al. combined “Xingnao Kaiqiao” acupuncture with modified constraint-induced movement therapy and found improvements in brain topography, cerebral blood flow, and affected limb function [30].

3. Mechanistic Research Progress

Mechanistic studies of acupuncture-assisted rehabilitation for post-stroke hemiplegia mainly focus on neuroplasticity, brain network remodeling, hemodynamic improvement, and enhanced motor learning. The technical standard for eye-acupuncture-assisted rehabilitation formulated by Shao Yan et al. provides a foundation for clinical standardization and subsequent mechanistic research [1]. Zhao Xue et al. summarized the application of acupuncture-assisted rehabilitation in post-stroke sequelae from a holistic perspective, suggesting that it may exert effects through multiple targets and multiple pathways [2].

From the perspective of traditional Chinese medicine, reviews on characteristic acupuncture methods for spastic hemiplegia after stroke suggest that acupuncture may work by unblocking meridians, regulating qi and blood, and relieving spasticity [3]. Research progress on motor acupuncture for post-stroke upper limb motor dysfunction further indicates that the combination of acupuncture and active movement may enhance functional reconstruction of the affected limb [4]. Li Kaiyu et al.’s theoretical analysis of the “regulating the spirit and

unblocking the meridians” acupuncture method emphasized its advantages in awakening the brain, regulating the spirit, and unblocking the meridians [5].

In specific clinical studies, eye-acupuncture-assisted rehabilitation may promote functional recovery by facilitating nerve repair and angiogenesis [6–8]. Improvements in upper limb, swallowing, shoulder-hand syndrome, and gait function also suggest that it has both central and peripheral regulatory effects [9–12]. Studies on scalp-acupuncture-assisted rehabilitation indicate that synchronous training during needle retention can improve upper limb and hand function recovery [13–15]. Research on Tongdu-Tiaoshen acupuncture combined with rehabilitation and medication also suggests benefits in neurological function, motor function, and quality of life [16–18].

Studies on Xingnao Kaiqiao-related acupuncture have further shown, from imaging and functional perspectives, that acupuncture combined with training can promote corticospinal tract remodeling, improve motor control, and enhance balance function [19–24]. The combined use of motor acupuncture, motor imagery therapy, functional electrical stimulation, and modified constraint-induced movement therapy reflects the high compatibility of acupuncture-assisted rehabilitation with modern neurorehabilitation concepts [25–30]. Overall, acupuncture - assisted rehabilitation may achieve functional recovery after post-stroke hemiplegia through the pathway of “acupuncture stimulation–sensory feedback–motor learning–central nervous system remodeling.”

4. Challenges and Future Directions

Although acupuncture-assisted rehabilitation has shown encouraging progress in the treatment of post-stroke hemiplegia, several issues remain. First, the methodological quality of existing studies varies considerably; some have small sample sizes and are single-center studies, and the quality of randomization, blinding, and allocation concealment still needs improvement. Second, outcome measures are not standardized. Different studies commonly use scales such as FMA, MBI, NIHSS, BBS, WMFT, and Brunnstrom staging, limiting comparability of results. Third, there is a lack of head-to-head comparisons among different acupuncture methods, making it difficult to determine the advantages and indications of each protocol. In addition, although some imaging and clinical observation studies have suggested mechanisms involving neuroplasticity, corticospinal tract remodeling, and cerebral blood flow improvement, the overall mechanistic evidence remains insufficient.

Future studies should conduct multicenter, large-sample randomized controlled trials, standardize outcome measures, deepen mechanistic research, and strengthen comparative studies among different acupuncture methods and rehabilitation models to clarify the optimal intervention pathway for acupuncture-assisted rehabilitation in post-stroke hemiplegia. At the same time, technical standardization and process normalization should be emphasized to support broader clinical implementation.

5. Conclusion

Acupuncture-assisted rehabilitation integrates the holistic regulatory advantages of traditional Chinese acupuncture with the functional reconstruction principles of modern rehabilitation, showing promising clinical potential in the treatment of post-stroke hemiplegia. Existing studies indicate that various approaches, including eye-acupuncture-assisted rehabilitation, scalp-acupuncture-assisted rehabilitation, Tongdu-Tiaoshen acupuncture, Xingnao Kaiqiao acupuncture, and motor acupuncture, can improve motor function, gait and balance, and quality of life to varying degrees in patients after stroke. With further research, acupuncture-assisted rehabilitation is expected to become an important component of post-stroke hemiplegia rehabilitation.

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