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Research Progress of Acupuncture in the Treatment of Post-Stroke Spastic Paralysis

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Abstract: *Stroke is a cerebrovascular disease, and its complications have seriously endangered the physical and mental health and life safety of people nowadays. Spastic hemiplegia is one of the serious complications and sequelae of stroke, and acupuncture has been shown to be effective in improving the degree of limb spasticity, daily living ability and limb motor function in stroke hemiplegia patients. The author reviewed the recent literature for an overview in order to provide a basis for the development of standardized clinical implementation protocols.*

Keywords: *Acupuncture; Stroke; Research Progress; Sequela of Apoplexy*

1. Introduction

Stroke, which is cerebrovascular disease, has three high characteristics, namely high prevalence, high mortality and high disability characteristics, from the global burden of disease (GBD) shows that in 2019, 3.94 million new strokes occurred in China, with a stroke incidence rate of 276.7/100,000, 269.2/100,000 for men and 284.5/100,000 for women. The prevalence was 2022.0/100,000, and the crude death rate was 153.9/100,000, 174.0/100,000 for men and 133.1/100,000 for women, whose male mortality rate was significantly higher than that of women (Table 1, Figure 1). The mortality rate of cerebrovascular disease has gradually decreased over the years with the development of cerebrovascular disease treatment technology, but most of the stroke patients have stroke sequelae - limb dysfunction [1]. The majority of patients with limb dysfunction are suffering from spastic paralysis. The use of acupuncture for post-stroke limb dysfunction is widely recognized in clinical practice, and some studies have shown that acupuncture is effective in treating post-stroke limb dysfunction [2]. In recent years, different acupuncture treatment options for post-stroke upper limb spasticity have emerged in China, mainly including fire acupuncture, electro acupuncture, and small acupuncture knife (Figure 2), and this paper mainly reviews the more popular acupuncture treatment tools in China in recent years.

Table 1: Stroke-related data for the Chinese population in 2019.

	Male	Female	Overall population
Incidence rate(/100000)	269.2	284.5	276.7
Prevalence rate (/100000)	1770.7	2283.2	2022.0
Death rate(/100000)	174.0	133.1	153.9

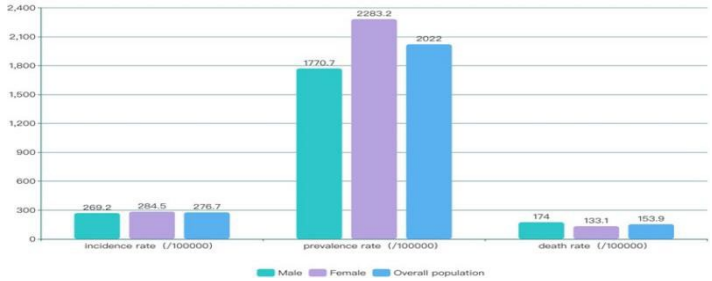

Figure 1: Stroke-related data for the Chinese population in 2019

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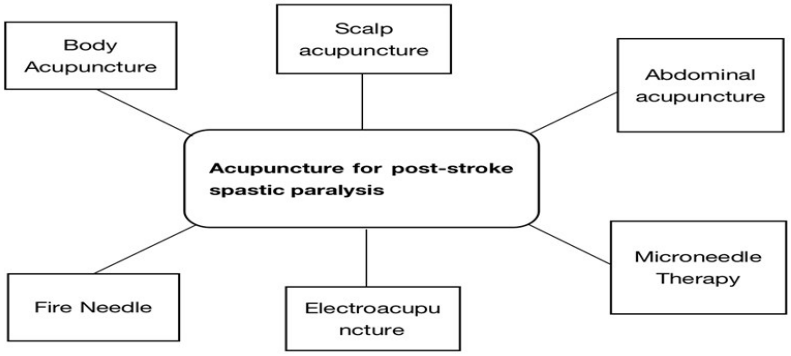

Figure 2: Acupuncture for post-stroke spastic paralysis

2. Body Acupuncture

Li Wenlong [3] used the "nourishing blood and softening liver" acupuncture method to treat upper limb spastic paralysis after ischemic stroke, and evaluated the changes of muscle tone, improvement of upper limb motor function, and improvement of daily living ability using MAS and FMA-UE. There was a significant difference in the upper limb muscle tone between the two groups after 6 weeks of treatment, and the observation group was stronger. Hui Jian'an [4] used Xifengluo blood-activating acupuncture method to treat post-stroke spastic paralysis, and used FMA and modified Barthel index to evaluate the improvement of patients' limbs before and after treatment, and the results showed that the FMA and modified Barthel index scores before and after treatment were higher in the treatment group than in the control group. Gao Feng [5] selected 68 subjects and divided them into treatment and control groups, in which the treatment group was treated with "tonifying the kidney to dispel stasis" combined with floating acupuncture, and the control group was only treated with "tonifying the kidney to dispel stasis" acupuncture, and the NIHSS and MAS scales were selected as the observation index. The NIHSS and MAS scales were used to evaluate the neurological deficit and the degree of spasticity of the hemiplegic limb before and after treatment. The test data showed that the neurological deficit of the patients improved significantly after treatment, and the degree of spasticity of the elbow, wrist, knee and ankle joints decreased significantly. Zhang Jiarui [6] used the idea that the upper extremity is "Yin pole but Yang slow, and the lower extremity is Yang slow but Yin pole" to treat post-stroke spastic paralysis by harmonizing Yin and Yang acupuncture. The control group took the basic treatment + rehabilitation treatment + conventional acupuncture method, while the experimental group took the basic treatment + rehabilitation treatment + reconciliation of yin and yang acupuncture method. The observation indexes were MAS, FMA, MBI, and Chinese medicine evidence assessment. These four evaluation scales were used to compare the efficacy before and after treatment. The results showed that both groups could improve the degree of limb spasticity and paralysis, and the results of both groups were significantly stronger in the treatment group than in the other group, confirming that the efficacy of the harmonizing yin-yang acupuncture method was stronger than that of ordinary acupuncture.

3. Head Acupuncture

Jiao Cuicui [7] used head acupuncture combined with ventral acupuncture to treat post-stroke spastic paralysis. 64 subjects were collected and randomly divided into a control group and a treatment group of 32 subjects each, the control group was treated with conventional acupuncture, the treatment group was treated with head acupuncture combined with ventral acupuncture on this basis, and the rest of the basic operations were the same in both groups. The results showed that both the control group and the treatment group had different degrees of improvement in the degree of limb spasticity and daily living ability before and after treatment, of which 84.38% was the total effective rate in the treatment group, compared with 59.38% in the control group, and the degree of limb spasticity, motor function and daily living ability in the treatment group before and after treatment were significantly improved compared with those in the control group (P less than 0.05), which was statistically significant, confirming that the treatment effect of head acupuncture combined with ventral acupuncture was stronger than that of traditional acupuncture therapy in patients with post-stroke spastic paralysis. Zhang Wei [8] randomly divided 82 patients with post-stroke spastic hemiparesis into a control group and an observation group (n=41), while the control group was selected for proprioceptive neuromuscular facilitation (PNF) rehabilitation therapy. The treatment group, on the other hand, was combined with interactive head

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injection in the control group. Observation indexes were used to determine the clinical efficacy according to the Chinese Stroke Rehabilitation Treatment Guidelines [9], Berg Balance Scale, Fugl-Meyer Scale, Bartholomew Index Scale, and adverse reactions. Conclusion: Berg, FMA, and BI scores were higher in the observation group than in the control group, indicating that interactive head acupuncture with conventional rehabilitation could effectively alleviate the degree of limb spasticity and improve the motor function of the hemiplegic side of the patient after stroke.

4. Abdominal Acupuncture

Jin Lingqing [10] divided 120 patients into a control group and a treatment group using the random number method, and the treatment group used abdominal acupuncture combined with "one-to-one" training method, while the control group used abdominal acupuncture therapy. The modified Ashworth score (MAS) method and the baroreflex index (BI) were selected as observation indexes, and both groups were treated for 8 weeks. The combination of abdominal acupuncture and exercise therapy can effectively improve the movement disorder of limbs in patients with post-stroke spastic paralysis, enhance the patients' ability of daily living and improve their quality of daily living, and can be used for promotion.

5. Special Acupuncture Method

5.1. Electro acupuncture

Electro acupuncture is the continuous stimulation of a specific area by applying a needle with a fine current at a certain frequency, which has the characteristics of precise stimulation and can replace the doctor's needles, and can improve the therapeutic effect in combination with acupuncture. Zhao Shufang [11] used electro acupuncture to treat upper limb dysfunction after stroke by selecting the flexor side of the transverse tendon node with mild moxibustion, and the results showed that the total effective rate of the control group was 84.38% and the total effective rate of the treatment group was 93.75%. Paralysis with significantly higher efficacy than conventional acupuncture. Yue Zenghui [12] used electro acupuncture and manual acupuncture to treat post-stroke spastic paralysis, and the results showed that the total effective rate of the electro acupuncture group was 90.9% and the total effective rate of the manual acupuncture group was 83.9%, and the difference in SIAS points between the two groups after treatment was statistically significant, and the efficacy of the electro acupuncture group was better than that of the manual acupuncture group. Wang Xiangbin [13] selected different frequencies of electro acupuncture for the treatment of lower limb spasticity in stroke, using dense wave 100HZ, 50HZ continuous wave and 2HZ sparse wave for stimulation, and the observation indexes were Fugl-Meyer evaluation, surface electromyography (sEMG) detection, and Holden walking function classification (FAC) for hemiplegic patients, and the results showed that different frequency stimulation in all three groups could make walking function significantly improved compared with the previous one (all $P<0.01$); and the 100 Hz group was better than the remaining two groups (all $P<0.05$); the difference between the 50 Hz group and the 2 Hz group was not statistically significant ($P>0.05$).

5.2. Fire Acupuncture Therapy

In ancient times, fire needling was called "burnt needling", which is a method of rapidly piercing the body with a red-hot needle tip, which is characterized by strong stimulation and short duration. Fu Aihui [14] used fire acupuncture to treat myospastic paralysis of the upper limbs after stroke, and the results showed that fire acupuncture significantly improved the motor function, nerve function repair and myospasm of the upper limbs of the subjects, and the treatment effect of fire acupuncture was stronger than that of the traditional acupuncture group. Shu Ting [15] used fire acupuncture to treat upper limb myospasm after stroke using Fugl-Meyer (FMA), modified Barthel index score (MBI), and modified Ashworth (M) acupuncture. The results indicated that the patients in both groups improved on the FMA, MBI and MAS scales, and the improvement was more significant in the treatment group. It proved that both fire acupuncture and conventional acupuncture were effective in improving patients with upper limb spasticity, and the clinical efficacy of fire acupuncture was stronger than that of conventional acupuncture. Xia Chen [16] used fire acupuncture flash acupuncture, conventional acupuncture and conventional rehabilitation to treat spastic paralysis of the upper limbs after stroke, respectively. Four evaluation scales, MAS, FMA, BI, and MRS, were used to assess the relief effect of spasticity, motor function of the affected limb, daily living ability, and degree of neurological deficit of

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the hemiplegic side after stroke, respectively, and the results indicated that the scores of the fire acupuncture flash acupuncture group were higher than the remaining two groups, and the treatment effect was superior to the remaining two groups.

5.3. Floating Acupuncture Therapy

The floating needle is a special needle tool consisting of a needle core, needle holder, hose and protective sleeve, which is used to loosen the connective tissue under the skin, which is called "skin" in Chinese medicine to protect the body from external invasion and to map the lesions of internal organs and meridians to the body surface. Xu [17] divided 80 patients into control and observation groups, with the former only undergoing rehabilitation therapy and the latter treated with floating needle reperfusion therapy on this basis.

5.4. Microneedle Therapy

Small needle knife therapy is a kind of closed release operation, Wen Hui [18] divided 120 patients into needle knife group and acupuncture group (n=60), the course of treatment for the needle knife group was 2 weeks once, 4 weeks as a course of treatment, and the acupuncture group was treated continuously for 4 weeks, 4 weeks as a course of treatment, the results showed that the total effective rate of 86.7% in the needle knife group was significantly higher than the total effective rate of 65% in the acupuncture group, and the muscle tone scores of the subjects in both groups were reduced after treatment. The improvement was more significant in the acupuncture group, which proved that the efficacy of small acupuncture in treating post-stroke spastic paralysis was significantly stronger than that of the conventional acupuncture treatment group.

6. Integrated Therapy

6.1. Acupuncture Combined with Herbal Therapy

Wang Wei [19] divided 121 patients into a control group and an observation group. In the control group, appropriate acupoints on the upper and lower limbs of subjects were selected by conventional acupuncture. In the observation group, Wenyang Tongluo Decoction was added to the conventional acupuncture of the control group, 50 ml/time, 3 times/day, and the treatment course was 1 month. Evidence-based points of TCM, FMA scores of upper and lower limbs and SS-QOL scores were used as evaluation indicators, and SPSS25.0 was used for analysis. The results showed that the FMA scores and SS-QOL scores of upper, and lower limbs of patients after treatment were higher than those before treatment. The scores of observation group were significantly higher than those of control group ($P < 0.05$). It was confirmed that acupuncture combined with Wenyang Tongluo Decoction had a remarkable effect in the treatment of spastic hemiplegia after stroke, which could effectively improve the clinical symptoms and motor functions of upper and lower limbs, and improve the quality of life of patients.Hou Xiaoyun [20] divided 56 subjects into the control group and the study group according to the double color ball method. The control group was given Buyang Guiwu Decoction, 1 dose/day, divided into two parts, and taken in the morning and evening before meals. The study group was treated with acupuncture and massage combined with Buyang Guwu decoction, rolling massage for 3 minutes in the dominant parts of spasm. At the same time, rub the spastic lower part of the palm of the hand until the skin is warm. Experimental data showed that the total effective rate of the study group was 89.29%, and that of the control group was 71.43%. MAS and FMA scores of the study group were significantly lower than those of the control group after treatment ($P < 0.05$), and the differences were statistically significant. Li Qingzhe [21] randomly divided 69 patients into 3 groups (n=23). The control group only received conventional treatment.The traditional Chinese medicine group was treated with Tongkang Huoxuet Decoction on the basis of the first group.The observation group was treated with acupuncture pinch point on the basis of the traditional Chinese medicine group.All three groups were treated for 4 weeks. The outcome measures were modified Barthel Index score (MBI), modified Ashworth Spasticity Rating Scale score (MAS), and Fugl-Meyer Motor function score (FMA). The results showed that the total effective rate of control group, TCM group and observation group respectively was 56.5%, 73.9% and 91.3%. After 4 weeks of treatment, the MBI and FMA scores of TCM group and observation group were higher than those of control group, while MAS scores of TCM group and observation group were lower than those of control group, with statistical significance ($P<0.05$). It was proved that Tongkang Huoxue Decoction combined with pinch point therapy could

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effectively inhibit the spasticity of the patients. The therapy could effectively inhibit the spasticity of the affected limb, reduce the high muscle tension of the affected limb, and greatly improve the daily living ability of the patients, which was worth popularizing in clinical practice. Search database shows that there are several formulations that can effectively relieve symptoms (Figure 3), but clinical treatment should be based on the actual diagnosis and treatment of the disease and then the right medicine, remember not to copy the current use.

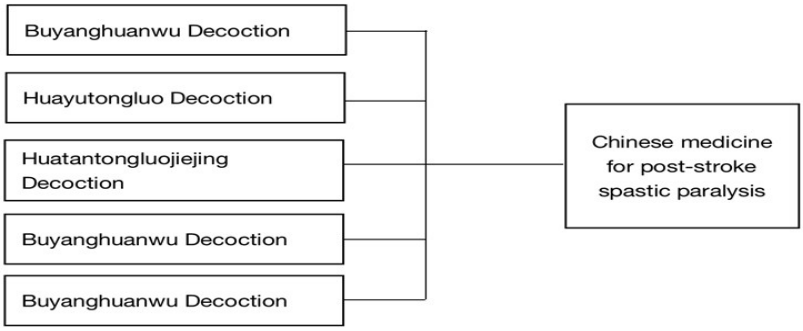

Figure 3: Chinese medicine for post-stroke spastic paralysis

6.2. Acupuncture Combined with Modern Rehabilitation Training

Ma Aifeng [22] divided the subjects into a treatment group and a control group. The control group was given basic stroke treatment with rehabilitation training, and the treatment group was combined with acupuncture therapy on the control group. The differences of Fugl-Meyer (FMA) score, upper limb modified Ashworth scale and lower limb clinical spasticity index (CSI), electrophysiological indexes [H reflex H/M max value, surface EMG value (i EMG), root mean square value (RMS) and median frequency (MF)] were observed. The results showed that the total effective rate was 90.5% in the treatment group and 73.8% in the control group ($P < 0.05$); FMA score, CSI score, upper and lower limb spasticity grading, H reflex H/M max value, i EMG, RMS and MF were significantly higher in both groups after treatment than before treatment ($P<0.05$), and the indexes were significantly better in the treatment group than in the control group after treatment ($P<0.05$). Li Weixia [23] treated post-stroke spastic paralysis with acupuncture combined with Bobath technique, and 70 subjects were divided into control and treatment groups using randomized numbers. In the former group, ordinary acupuncture was selected once a day for 6 days for a total of 5 sessions, while in the latter group, the Bobath technique was combined with the former treatment. The differences in FMA and MAS scales were observed before and after treatment. The results showed that the total effective rate was 94.28% and 85.71% in the treatment and control groups, respectively, and the symptoms of the subjects in the treatment group were significantly improved. It was confirmed that the combination of acupuncture and Bobath technique can effectively reduce the degree of limb spasticity and improve the quality of daily life of patients, which can be used for promotion. Today's rapid technological advances have led to the emergence of more efficient modern rehabilitation techniques (Figure 4), which have greatly improved the cure rate of patients.

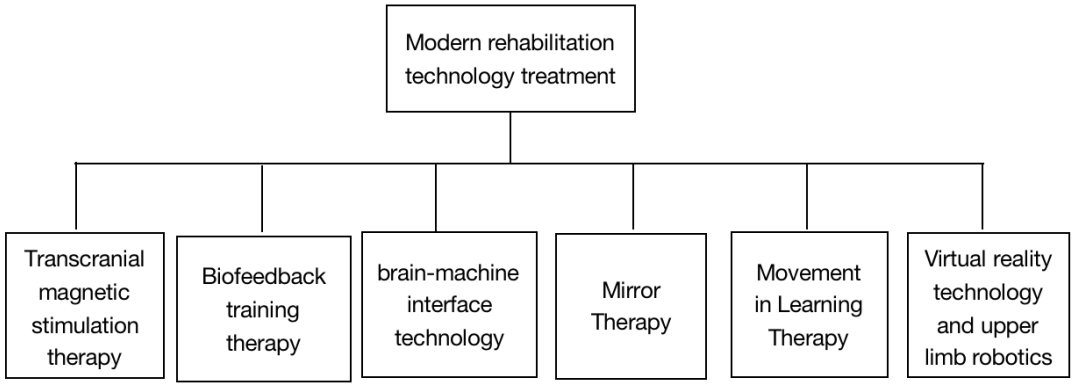

Figure 4: Modern rehabilitation technology treatment

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7. Summary

In summary, acupuncture treatment can significantly improve motor function, neurological function and spasticity of the affected limb in patients with post-stroke spastic paralysis, and significantly improve the quality of daily life in patients with spastic hemiplegia of the stroke limb, and its efficacy has been clinically recognized. Among them, the author found through literature reading that more and more acupuncture literature is now combined with modern rehabilitation medicine techniques, and studies have shown that the efficacy is significantly improved, such as: acupuncture combined with Bobath technique, acupuncture combined with Rood technique, etc. This indicates that the effect of acupuncture treatment has been highly recognized by most medical colleagues, but there are still some shortcomings in the clinical trials of acupuncture for post-stroke spastic hemiplegia. However, the current clinical trials of acupuncture for post-stroke spastic hemiplegia have some shortcomings, such as small sample size, not multicenter clinical trial studies, and no clinical standardized protocol of acupuncture for this disease.

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