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Special Topic Study

Applying tuina to exterior-interiorly connected meridians for post-stroke upper limb spasticity

表里两经推拿治疗脑卒中后上肢偏瘫痉挛状态

Di Hong-yan (邸鸿雁)[1], Han Shu-kai (韩淑凯)[2], Du Xiao-lin (杜孝林)[3], Li Wen-wen (李雯雯)[4], Jia Jing (贾静)[4]
1 The First Central Hospital of Baoding City, Hebei Province, Baoding 074000, China
2 Wangdu County Hospital of Chinese Medicine, Hebei Province, Wangdu 072450, China
3 The Fifth Hospital of Baoding City, Hebei Province, Baoding 071000, China
4 The First Hospital of Chinese Medicine of Baoding City, Hebei Province, Baoding 071000, China

Abstract
Objective: To observe the effect of applying tuina to exterior-interiorly connected meridians for post-stroke upper limb spasticity.
Methods: A total of 150 patients with post-stroke upper limb spasticity were randomly allocated into a treatment group (*n*=75) and a control group (*n*=75) by the random number table. Patients in the treatment group received tuina on exterior-interiorly connected meridians, whereas patients in the control group received standard rehabilitation therapy. The therapeutic efficacies in both groups were observed after 3 weeks of treatment.
Results: The total effective rate in the treatment group was 89.3%, versus 61.3% in the control group, showing a statistically significant difference ($P<0.05$). After the treatment, the muscle tones by the modified Ashworth scale (MAS) were significantly improved in both groups (both $P<0.05$); and the improvement of muscle tone was more significant in the treatment group than that in the control group ($P<0.05$).
Conclusion: Applying tuina to exterior-interiorly connected meridians can obtain an exact efficacy for post-stroke upper limb spasticity.
Keywords: Tuina; Massage; Poststroke Syndrome; Hemiplegia; Myospasm; Activities of Daily Living; Rehabilitation

【摘要】目的：观察表里两经推拿治疗脑卒中后上肢偏瘫患者痉挛状态的临床疗效。**方法：**符合诊断标准的脑卒中后上肢痉挛性偏瘫患者 150 例，采用随机数字表法随机分为治疗组和对照组，每组 75 例。治疗组给予表里两经推拿治疗，对照组给予常规康复治疗，治疗 3 星期后观察疗效。**结果：**治疗组和对照组的总有效率分别为89.3%和 61.3%，两组比较，差异有统计学意义($P<0.05$)。两组患者治疗后，肌张力 Ashworth 分级较治疗前均有明显改善(均 $P<0.05$)，治疗组在肌张力 Ashworth 分级方面显著优于对照组($P<0.05$)。**结论：**表里两经推拿法治疗脑卒中后上肢偏瘫患者痉挛状态疗效确切。
【关键词】推拿；按摩；中风后遗症；偏瘫；肌痉挛；日常生活活动；康复
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Along with the improvement in the diagnosis and care of stroke patients, mortality is significantly decreased; however, residual disability is considerably increased. Approximately 80% of stroke survivors (6-7 million) experience sequela of stroke, which greatly affect the patients' quality of life and family/social cost[1]. Studies have shown that tuina has an exact efficacy for increased muscle tone after stroke[2-4]. We have treated patients with post-stroke upper limb spasticity by applying tuina to exterior-interiorly connected meridians and compared with simple rehabilitation training. The results are now summarized as follows.

Author: Di Hong-yan, associate chief physician
Corresponding Author: Han Shu-kai, chief physician.
E-mail: hanshukai1975@163.com

1 Clinical Materials

1.1 Diagnostic criteria

1.1.1 Diagnosis in Western medicine

This was based on the *Key Diagnostic Points for Cerebrovascular Diseases*[5], coupled with CT scan or MRI examination.

The diagnosis for upper limb spasticity was based on the *Clinical Diagnosis and Treatment Guidelines*: *Fascicle of Physical Medicine*[6]: increased resistance during passive movement of upper limbs, severe muscle spasticity manifests as joint rigidity at a certain angle of flexion or extension; local joint and muscle pain, long-time spasticity may cause muscle or tendon contracture; tendon hyperreflexia of the spastic upper

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limb; and impaired upper limb motor function and activities of daily living (ADL).

1.1.2 Diagnosis in Chinese medicine

This was based on the *Standard for Diagnosis and Therapeutic Effect Evaluation of Stroke* (trial) by Collaborative Group of Acute Encephalopathy of State Administration of Traditional Chinese Medicine in 1996[7].

1.2 Inclusion criteria

Those who met the above diagnostic criteria; aged between 40 and 80 years, having stable vital signs and clear consciousness; muscle tone $\geqslant 1$ but $\leqslant 4$ according to the modified Ashworth scale (MAS); II, III and V stage by Brunnstrom approach; having a duration of less than 3 months; willing to participate in this trial and signed the informed consent.

1.3 Exclusion criteria

Those with critical or acute unstable conditions, coupled with unconsciousness or cognitive impairment; having severe complications of heart, lung, liver and kidney diseases, diabetes or bleeding tendency; and those who recently have taken sedatives or muscle relaxants.

1.4 Statistical management

The intent-to-treat analysis was made by the research group on all cases who received at least one treatment after randomized grouping. Then efficacy analysis was made on patients who met the test design, with good compliance, completed all treatments and finished the case report form (CRF).

Statistical analysis was performed with SPSS 14.0 version software. The inter-group comparison was made using the analysis of variance. The intra-group comparison was made using the paired *t*-test before and after the treatment. The grouped data and enumeration data were analyzed using the Chi-square test. The ranked data were processed using the *Ridit* analysis. A *P* value of less than 0.05 indicated a statistical significance.

1.5 General data

A total of 150 eligible inpatients and outpatients treated in Neurology Department, the First Central Hospital of Baoding City, and Acupuncture Department, Wangdu County Hospital of Chinese Medicine were recruited in this study. They were randomly allocated into a treatment group ($n=75$) and a control group ($n=75$). There were no significant between-group differences in gender, age and stroke type ($P>0.05$), indicating that the two groups were comparable (Table 1).

Table 1. Between-group comparison in general data

Group	*n*	Gender (case)		Mean age ($\bar{x}\pm s$, year)	Stroke type (case)	
		Male	Female		Infarction	Hemorrhage
Treatment	75	48	27	61.4±5.2	42	33
Control	75	46	29	61.7±5.3	39	36

2 Treatment Methods

2.1 Treatment group

Patients in the treatment group received tuina therapy.

According to the interior-exterior connection of meridians, the meridians on the upper limb were classified into three groups: the Lung Meridian and the Large Intestine Meridian; the Pericardium Meridian and the Triple Energizer Meridian; the Heart Meridian and the Small Intestine Meridian. First, the practitioner applied heavy fast Gun-rolling and Na-grasping manipulations to the three yin meridians of hand from the shoulder joint towards the wrist; then applied gentle slow Rou-kneading and Ca-rubbing manipulations to the three yang meridians of hand from the wrist towards the shoulder joint. The practitioner was supposed to increase the force gradually until the patient felt soreness, numbness, distension and mild pain. Lasting, forceful and even force were especially focused on the Five Shu-Transmitting points and Luo-Connecting points.

The treatment was done 15 min each time, twice a day, for a total of 3 weeks.

2.2 Control group

Patients in the control group received anti-spasticity rehabilitation training once a day. The training included good limb position, maintaining of joint range of motion, alleviation of spasticity around body movement control points, static muscle stretching, and passive movement and passage. Each training lasted 20 min, once a day, for a total of 3 weeks.

3 Efficacy Observation

3.1 Observation items

The muscle tone of upper limbs was assessed using the modified Ashworth scale (MAS)[8].

0: No increase in muscle tone.

1: Slight increase in muscle tone, manifested by a catch and release or minimal resistance at the end of the range of motion (ROM) when the affected part was in flexion or extension.

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1^{+}: Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM.

2: More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved.

3: Considerable increase in muscle tone, passive movement difficult.

4: Affected part(s) rigid in flexion or extension.

3.2 Overall efficacy evaluation

The neurological impairment in all cases was assessed before and after the treatment according to the neurological impairment scale (NIS) made in the 1995 National Academic Conference on Cerebrovascular Diseases[1].

Basically recovered: The NIS score reduced by 91%-100%.

Marked effect: The NIS score reduced by 46% to 90%.

Improvement: The NIS score reduced by 18% to 45%.

Failure: The NIS score reduced by ＜18%.

3.3 Results

3.3.1 Comparison in overall efficacy

After 3 weeks of treatment, the total effective rate was 89.3% in the treatment group, versus 61.3% in the control group, showing a statistically significant difference (P＜0.05) and indicating a better effect in the treatment group than that in the control group (Table 2).

3.3.2 Comparison in muscle tone

After the treatment, spasticity in both groups were significantly improved (both P ＜ 0.05); and the improvement was more significant in the treatment group than that in the control group, showing a statistically significant difference (P ＜ 0.05) and indicating a better spasticity improvement in the treatment group than that in the control group (Table 3).

Table 2. Between-group comparison in clinical efficacy

Group	n	Basically recovered	Marked effect	Improvement	Failure	Total effective rate (%)
Treatment	75	42	17	8	8	89.3[1)]
Control	75	26	13	7	29	61.3

Note: Compared with the control group, 1) P＜0.05

Table 3. Between-group comparison in muscle tone (MAS) before and after the treatment

Group	n	Before treatment					After treatment				
		0	1	1^{+}	2	3	0	1	1^{+}	2	3
Treatment	75	0	5	17	21	32	46	15	8	4	2
Control	75	0	1	20	23	31	15	17	18	16	9

4 Discussion

In modern medicine, post-stroke upper limb spasticity is one part of the upper motor neuron syndrome[9]. Some scholars believe it might be associated with the failure of the brain to control the low-level center (spinal cord)[10], biomechanics[11], and reflex mediation[12-13].

Currently, there is no standardized treatment protocol for post-stroke upper limb spasticity. Baclofen, dantrolene, botulinum toxin (botox), and other sedatives are often used to alleviate spasm; however, these medications may affect the patients' mental state and gastrointestinal functions. Due to high cost and technique demand, muscle spasticity-alleviating Botox A and B cannot be extensively used in clinical practice.

In Chinese medicine, stroke occurs as a result of disordered qi and blood and imbalance of yin and yang. Yin-yang imbalance also contributes to the upper limb spasticity following stroke, manifesting as 'flaccidity of yang and spasm of yin'. The treatment strategies in tuina therapy are to restore yin-yang balance and adjust functions of the five Zang organs. Applying tuina to exterior-interiorly connected meridians is based on the theories on Zang-fu organs and meridians. The twelve regular meridians are associated with internal Zang-fu organs. Yin meridians are associated with the Zang organs (interior), whereas yang meridians are associated with the Fu organs (exterior). Physiologically, the interior-exteriorly connected meridians are connected. Pathologically, they can be mutually affected. Patients with post-stroke upper limb spasticity present with spasticity of the flexor muscles and flaccidity of the extensor muscles, i.e., yin-yang imbalance. The treatment strategies of tuina therapy are to reinforce healthy qi and remove pathogenic factors. Reducing tuina manipulation along the three hand yin meridians can relax muscles and tendons, regulate the functions of Zang-fu organs and meridians, coordinate different parts of the body and balance excitability and inhibition. At the same time, reinforcing tuina manipulation along the three hand yang meridians can activate upper limb nerve, improve neurotrophy, boost nerve tissue metabolism and thus increase nerve excitability and

help the recovery of the impaired nerve. On the other hand, it can circulate blood and increase muscle tone. To sum up, tuina along the meridians can alleviate spasticity by inhibiting nerve excitability through stimulating dominant muscle groups and increase muscle tone by activating nerve/muscle excitability through stimulating non-dominant muscle groups. This can further activate muscle proprioceptor to maintain and coordinate normal muscle tone and motor function and result in isolated movement[14-16]. The exact efficacy of tuina for post-stroke upper limb spasticity might be associated with its dual regulation on cerebral cortex: modulating the excitation and inhibition of the cortex[17-21]. Further research is needed regarding its underlying action mechanism.

Conflict of Interest

The authors declared that there was no potential conflict of interest in this article.

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Statement of Informed Consent

Informed consent was obtained from all individual participants included in this study.

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Translator: Han Chou-ping (韩丑萍)

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