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Special Topic Study

Clinical observation of tuina plus rehabilitation therapy for lower limb extensor spasticity in recovery stage of stroke

推拿结合康复治疗脑卒中恢复期下肢伸肌痉挛的临床观察

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Abstract

Objective: To observe the clinical efficacy of traditional tuina plus modern rehabilitation in the treatment of lower limb extensor spasticity during stroke recovery.

Methods: A total of 93 stroke patients who met the inclusion criteria were randomly divided into an observation group and a control group. Forty-four patients in the observation group were treated with traditional tuina plus modern rehabilitation, and 49 patients in the control group were treated with modern rehabilitation. The modified Ashworth scale (MAS), the Fugl-Meyer assessment scale (FMA) and the modified Barthel index (MBI) were used to evaluate the knee extensors state, lower limb motor function and activities of daily living (ADL) of the two groups.

Results: After treatment, the overall efficacy of the observation group was better than that of the control group, and the difference was statistically significant (P<0.05). After treatment, the MAS scores of both groups were significantly lower, FMA and MBI scores were significantly higher, and the differences were statistically significant in each group (P<0.01). After treatment, the MAS score of the observation group was lower than that of the control group, and the difference between the groups was statistically significant (P<0.01). The MBI score of the observation group was higher than that of the control group, and the difference between the two groups was statistically significant (P<0.05). There were significant differences in the post-treatment changes in MAS, FMA and MBI scores between the two groups (all P<0.05).

Conclusion: Traditional tuina plus modern rehabilitation therapy can effectively alleviate or prevent lower limb extensor spasticity after stroke, and improve limb mobility and ADL. Hence, it is worthy of clinical promotion.

Keywords: Tuina; Massage; Poststroke Syndrome; Hemiplegia; Myospasm; Activities of Daily Living; Rehabilitation

【摘要】目的：观察传统推拿结合现代康复治疗脑卒中恢复期下肢伸肌痉挛的临床疗效。**方法：**将符合纳入标准的93例脑卒中患者随机分为观察组和对照组，观察组44例采用传统推拿结合现代康复治疗，对照组49例采用现代康复治疗，并采用改良Ashworth量表(MAS)、简式Fugl-Meyer量表(FMA)和改良Barthel指数(MBI)评价两组患者下肢膝关节伸肌痉挛状态、下肢运动功能及日常生活活动能力(ADL)。**结果：**治疗后，观察组整体疗效优于对照组，差异有统计学意义(P＜0.05)。治疗后，两组患者的MAS评分均明显降低，FMA及MBI评分均明显升高，组内治疗前后差异均有统计学意义(均P＜0.01)。治疗后，观察组患者MAS评分低于对照组，组间差异有统计学意义(P＜0.01)；观察组MBI评分高于对照组，组间差异有统计学意义(P＜0.05)；两组患者治疗前后MAS、FMA及MBI评分差值均有统计学差异(均P＜0.05)。**结论：**传统推拿结合现代康复技术可以有效缓解或阻止脑卒中后下肢伸肌痉挛，改善患者肢体运动能力及ADL，值得临床推广。

【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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Cerebral apoplexy, also known as stroke, refers to acute disorders of the nervous system caused by cerebral hemorrhage or infarction or subarachnoid hemorrhage. It has become one of the three leading causes of death in humans. According to statistics, about 78%-88% of stroke patients can survive, but most stroke survivors experience different degrees of dysfunction such as limb movement disorder and speech disorder. Spasm of limb paralysis is the most common limb dyskinesia after stroke, in which the upper limb mainly presents a flexing status and the lower limb in extension[1]. Among them, the lower limb extensor can cause difficulty flexing the hip and knee, the flexion and the inversion of the disabled ankle, and stiffness of lower limbs when walking causing a circular gait, which may easily cause accidents such as fall[2]. If the spasm of limbs stays for a long time, it may cause

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the contracture deformity of the affected limb, which eventually results in permanent disability, seriously affecting the quality of life (QOL) of the patient. This study used traditional tuina plus modern rehabilitation to treat the lower limb extensor spasticity during stroke recovery.

1 Clinical Materials

1.1 Diagnostic criteria

Referred to the diagnostic criteria in *Key Diagnostic Points for Cerebrovascular Diseases*[3] stipulated on the Fourth National Conference on Cerebrovascular Diseases and the *Standards for Clinical Neurological Deficits in Stroke Patients*[4].

1.2 Inclusion criteria

Met the above diagnostic criteria; aged 40-60 years old; duration of disease 15-90 d; increased muscle tone in lower limbs, modified Ashworth scale (MAS) in grade Ⅰ-Ⅲ, stage Ⅲ-Ⅴ in Brunnstrom (six-stage Brunnstrom approach); patients with stable vital signs and clear consciousness; ≤2 times of onset; agreed to receive treatment plans for this study and signed informed consent.

1.3 Exclusion criteria

Surgical treatment for stroke; those with important organ dysfunction; those with cerebellar or extrapyramidal damage and severe dyskinesia; those with mental disorders; those unable to follow medical advice.

1.4 Statistical analysis

The data were statistically processed using SPSS version 19.0 software. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$). Two independent sample *t*-test was used for comparisons between groups, and paired *t*-test was used for comparisons within group. The rate was compared using Chi-square test. $P<0.05$ indicated that the difference was statistically significant.

1.5 Case source and grouping

A total of 93 stroke patients who met the diagnostic criteria from Traditional Chinese Orthopedic and Traumatology Hospital of Zhoushan, Zhejiang Province were included in the study between January 2015 and December 2016. Patients were randomly grouped according to the coin-sending method, the patient or family members tossed the coin at the time of the visit, the front side was the observation group (44 cases), and the reverse side was the control group (49 cases). Both groups of patients completed relevant treatment and evaluation, and there were no cases of shedding. There were no significant differences in gender, mean age, mean duration of disease, and type of stroke between the two groups (all $P>0.05$), (Table 1).

Table 1. Comparison of general data between the two groups

Group	*n*	Gender (case)		Average age ($\bar{x} \pm s$, year)	Average duration ($\bar{x} \pm s$, day)	Stroke type (case)		Hemiplegia side (case)	
		Male	Female			Hemorrhage	Infarction	Left	Right
Observation	44	27	17	51.6±4.9	43.9±20.4	20	24	25	19
Control	49	29	20	52.4±5.4	44.3±21.4	23	26	27	22

2 Treatment Methods

According to the actual situation of the two groups of patients, basic treatments were offered, such as controlling blood pressure, blood lipids, and blood sugar, along with symptom-based treatments including nutrition supplementary for nerves, protection for brain tissue, anticoagulation, anti-platelet aggregation, and fiber degeneration.

2.1 Observation group

2.1.1 Rehabilitation treatment

Rehabilitation of the affected lower limb was conducted by a professional rehabilitation doctor. The treatments included range of motion (ROM) training, activities of daily living (ADL) training, Bobath techniques, gait training, physical therapy and occupational therapy. The patients were prescribed with lower limb orthosis training when necessary. The training lasted 45 min each time, once a day, 10 d as a course, at a 2-day interval, for a total of 3 courses.

2.1.2 Traditional tuina therapy

Treatments were operated by a professional tuina doctor. The manipulations included one-thumb Tui-pushing, Gun-rolling, Rou-kneading, An-pressing and Tanbo-plucking.

The patient first took a supine position. The physician first applied one-thumb Tui-pushing to Guanyuan (CV 4) and Qihai (CV 6), and then applied the rolling method to the anterior and lateral flank of the patient's lower limb from the anterior superior iliac spine to the back of the foot, especially focusing on acupoints such as Futu (ST 32), Zusanli (ST 36) and Jiexi (ST 41), with passive flexion and extension exercise of the affected limb joint, for about 25 min each time. The patients then took a prone position. The doctor first An-pressed and Rou-kneaded the patient's back, buttocks and the back of the thigh, focusing on acupoints such as Xinshu (BL 15), Pishu (BL 20), Weishu (BL 21), Geshu (BL 17), Ganshu (BL 18), Danshu (BL 19), Shenshu (BL 23), Huantiao (GB 30), Weizhong (BL 40) and Kunlun (BL 60),

for about 10 min. Finally, the patient lied on the healthy side. The doctor applied Gun-rolling manipulation to the outside of the affected limb in combination with the passive movement of the hip and knee joint for about 10 min.

Each session of massage took about 45 min, once a day, 10 d for a course of treatment. There was a 2-day interval between two courses, and 3 courses were conducted in total.

2.2 Control group

The patients in the control group received rehabilitation treatment alone, with the same methods and treatment courses as those in the observation group.

3 Therapeutic Efficacy Observation

3.1 Observation items

3.1.1 Lower limb spasm

The spasm of knee extensors of lower limb was evaluated by MAS[4], and the different grades were scored (grade 0, Ⅰ, Ⅰ+, Ⅱ, Ⅲ and Ⅳ were scored 0, 1, 2, 3, 4 and 5 points, respectively). The higher the score, the more serious the spasm.

3.1.2 Lower limb motor function

Lower limb motor function was evaluated by the Fugl-Meyer assessment scale (FMA)[5] in 7 aspects such as with or without reflex activity, flexor muscle synergy, extensor muscle synergy, accompanied synergistic activity, separated synergistic activity, increased reflex and coordination and speed to evaluate activities of the hip joint, knee joint and ankle joint in a total of 17 items which were assigned 0, 1, and 2 points eachaccordingly. The FMA has a full score of 34 points. The higher the score, the better the motor function.

3.1.3 ADL

ADL was evaluated using the modified Barthel index (MBI)[6]. According to the patient's activity, it is divided into 5 levels: completely dependent, major help needed, moderate help needed, minor help needed and completely independent. Each level is scored respectively: grooming, bathing, and wheelchair using are scored 0, 1, 3, 4 and 5 points, respectively; feeding, toilet use, dressing, stool control, urination control, and up-down transfer are scored 0, 2, 5, 8 and 10 points, respectively; bed-chair transfer and walking are scored 0, 3, 8, 12 and 15 points, respectively. MBI has a maximum score of 135 points. The higher the score, the stronger the ADL and the lower the dependence on others.

3.2 Criteria of efficacy

The efficacy criteria were made according to the score of each scale.

Recovered: Lower limb extensor spasticity level 0, lower limb FMA score >30 points or reaching the pre-disease level, and ADL score >108 points or reaching the pre-disease level.

Markedly effective: Lower limb extensor spasticity declined by at least 2 grades, lower limb FMA score increased by >5 points, or ADL score increased by >30 points or approached the pre-disease level and ≥108 points.

Effective: Lower limb extensor spasticity declined by 1 grade, or lower limb FMA score increased by 1-4 points, or ADL score increased by 20 to 29 points and ≥81 points.

Invalid: No improvement in the lower limb extensor spasticity or even an increase in spasm grade, or no improvement or decrease in the lower limb FMA score, or the increase in the ADL score <20 points and the ADL score ≤80 points.

3.3 Results

3.3.1 Clinical efficacy

After treatment, the overall efficacy of the observation group was better than that of the control group, and the difference was statistically significant (P<0.05), (Table 2).

Table 2. Comparison of clinical effects between the two groups (case)

Group	n	Recovered	Markedly effective	Effective	Invalid	Z-value	P-value
Observation	44	3	25	13	3	2.987	0.003
Control	49	1	15	25	8		

3.3.2 MAS score

There was no significant difference in MAS score between the two groups before treatment (P>0.05). After treatment, the MAS score of the observation group was lower than that of the control group, and the difference between the two groups was statistically significant (P<0.01). There was a statistically significant difference in the post-treatment change in MAS score between the two groups (P<0.01), (Table 3).

3.3.3 Comparison of FMA score

Before treatment, there was no significant difference in the FMA score between the two groups (P>0.05). After treatment, the FMA score of the observation group was higher than that of the control group, but the difference between the two groups was not statistically significant (P>0.05). There was a statistically significant difference in the post-treatment change in FMA score between the two groups (P<0.05), (Table 4).

3.3.4 Comparison of MBI score

There was no significant difference in MBI score between the two groups before treatment (P>0.05). After treatment, the MBI score of the observation group was higher than that of the control group, and the difference between the two groups was statistically significant (P<0.01). There was a statistically significant difference in the post-treatment change in MBI score between the two groups (P<0.01), (Table 5).

Table 3. Comparison of MAS score between the two groups ($\bar{x}$ ±s, point)

Group	n	Before treatment	After treatment	Difference before and after treatment	t-value	P-value
Observation	44	3.22±0.89	1.67±0.92	1.55±0.43	8.023	0.000
Control	49	3.31±0.92	2.35±0.86	0.96±0.52	5.336	0.000
t-value		0.480	3.670	5.990		
P-value		0.320	0.000	0.000		

Table 4. Comparison of FMA score between the two groups ($\bar{x}$ ±s, point)

Group	n	Before treatment	After treatment	Difference before and after treatment	t-value	P-value
Observation	44	11.62±4.82	25.21±3.42	13.58±4.13	15.253	0.000
Control	49	12.12±4.79	24.59±6.16	11.47±6.32	11.187	0.000
t-value		0.500	0.610	1.920		
P-value		0.310	0.270	0.029		

Table 5. Comparison of MBI score between the two groups ($\bar{x}$ ±s, point)

Group	n	Before treatment	After treatment	Difference before and after treatment	t-value	P-value
Observation	44	21.62±7.82	55.21±14.42	33.59±11.13	13.583	0.000
Control	49	22.82±8.79	48.59±13.16	25.77±9.32	11.400	0.000
t-value		0.690	2.300	3.650		
P-value		0.240	0.011	0.000		

4 Discussion

In Chinese medicine, etiological factors of stroke can be external or internal. Externally, wind may block the flow of meridian qi and result in malnourishment. This theory has been established in the *Huang Di Nei Jing*: *Su Wen* (*Yellow Emperor's Classic of Internal Medicine*: *Essential Questions*) and *Zhu Bing Yuan Hou Lun* (*Treatise on the Origins and Manifestations of Various Diseases*). Internally, there are three explanations: disordered qi and blood due to internal stirring of liver wind, phlegm-stasis obstructing the brain, and blood stagnation due to qi deficiency. In summary, stroke results from obstruction of qi and blood or malnourishment of meridians[7]. The treatment strategies are therefore to circulate blood, resolve stasis and relax muscles/tendons.

Modern medicine believes that changes in blood components caused by increased blood viscosity, fibrinolytic system disorder or coagulopathy and brain blood circulation disorders due to vascular wall lesions caused by cerebral atherosclerosis, hypertension, cerebral arteriosclerosis and other diseases will cause cerebral vascular occlusion or rupture, under which brain tissue is damaged by supplying disorder and stroke occurs[8-10]. After the tissue is damaged, its dominating and regulating tissue and organ function are weakened, which eventually leads to muscle atrophy and limb disuse.

The patients in the observation group were treated with traditional tuina plus modern rehabilitation. The control group was treated with modern rehabilitation alone. The MAS, FMA and MBI evaluation systems were used to evaluate the spasm of knee extensors, lower limb motor function and ADL. The results showed that the changes of MAS, FMA and MBI scores of the observation group were better than those of the control group, and the differences were statistically significant (all P<0.05), indicating that the improvements in lower limb knee extensors, lower limb motor function and ADL in the observation group were more significant than those in the control group. Ancient Chinese doctors attached great importance to the early massage treatment after stroke. The earliest record of treatment with massage after stroke was found in *Ling Shu* (*Spiritual Pivot*). Tuina treatment for post-stroke can effectively promote blood circulation, recover the tendons, and achieve the purpose of treating hemiplegia after stroke[11]. Modern medical research shows that massage can not only increase the threshold

of body pain, but also fully stretch the muscles in tension or spasm, and finally relieve spasm and eliminate pain[12-14].

The proper posture of the healthy limbs in modern rehabilitation exercises can inhibit abnormal motor patterns in stroke patients and reduce limb paralysis[15-16]. The neurodevelopmental promotion technique can alleviate the lower limb spasm of stroke patients and restore their autonomic motor function[17-18]. The patient's limbs were passively stretched, and limb paralysis was inhibited by baroreceptors and muscle spindles[19]. Therefore, modern rehabilitation techniques can effectively reduce tendon spasm, help stroke patients to establish correct exercise patterns, and improve physical activity and ADL[20-21].

The results of this study showed that traditional tuina plus modern rehabilitation for the treatment of lower limb extensor spasticity after stroke can effectively alleviate or stop the spasm of extensors in the lower limb, improve the limb movement ability and ADL, and thus it is worthy of clinical promotion.

Conflict of Interest

There was no potential conflict of interest in this article.

Statement of Informed Consent

Informed consent was obtained from all individual participants or their relatives in this study.

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References

[1] Gong WJ, Zhang T, Sun XT. Advance in spasticity after stroke (review). Zhongguo Kangfu Lilun Yu Shijian, 2008, 14(3): 212-213.

[2] Liu BG, Yu XP. Comparative study on acupuncture at points in three yang meridians of foot for spasticity of lower limbs after stroke. Zhenjiu Linchuang Zazhi, 2012, 28(2):19-20.

[3] Chinese Neuroscience Society, Chinese Neurosurgical Society. Key diagnostic points for cerebrovascular diseases. Zhonghua Shenjingke Zazhi, 1996, 29(6): 379-380.

[4] Chinese Neuroscience Society, Chinese Neurosurgical Society. Criteria of clinic neurological function deficit scale for stroke patients (1995). Zhonghua Shenjingke Zazhi, 1996, 29(6): 381-383.

[5] Wei PX. Discussion on modified Ashworth scale. Zhongguo Kangfu Yixue Zazhi, 2014, 29(1): 67-68.

[6] Giraldi A. Axel Fugl-Meyer 1934-2012. J Sex Med, 2012, 9(11): 2736-2737.

[7] Sun S. Application of Barthel index in management of rehabilitation ward according to different levels. Zhongguo Yaowu Jingjixue, 2014, (z2): 153-154.

[8] Bao YJ. Discussion of the pathogenesis of complications of hemorrhagic stroke from collateral theory. Zhongguo Yiyao Zhinan, 2014, 12(11): 273-274.

[9] Sun KL, Yang FX, Wang J, Wang F. Research progress on inflammatory and immune mechanisms of stroke. Zhongguo Laonianxue Zazhi, 2015, 35(18): 5360-5362.

[10] Xie H, Liu XZ, Liu XQ. Research progress on pathogenesis and risk factors of progressive ischemic stroke. Zhongxiyi Jiehe Xinnaoxueguanbing Zazhi, 2016, 14(6): 612-614.

[11] Cheng YM. Occurrence and its mechanism of cognitive impairment in stroke patients. Shandong Yiyao, 2016, 56(28): 83-85.

[12] Zeng QY, Xie YM, Wang YY, Cao XL, Ye XQ. Discussion of the origin and development of tuina for stroke from ancient literature. Liaoning Zhongyi Zazhi, 2011, 38(3): 423-424.

[13] Qu Q, Zhang H, Zhang GH. Analysis on tendon-relaxing and collateral-unblocking action mechanism of massage Gun-rolling manipulation. Liaoning Zhongyi Zazhi, 2015, 42(3): 598-600.

[14] Wang GH, Wu JX. Research progress on action mechanisms of tuina therapy. Zhongguo Kangfu Yixue Zazhi, 2006, 21(9): 49-851.

[15] Di HY, Han SK, Du XL, Li WW, Jia J. Applying tuina to exteriorly-interiorly connected meridians for post-stroke upper limb spasticity. J Acupunct Tuina Sci, 2017, 15(1): 27-30.

[16] Feng XJ, Gao XP. Progress of rehabilitation treatment for myospasm after stroke. Zhonghua Wuli Yixue Yu Kangfu Zazhi, 2010, 32(5): 391-394.

[17] Wang XF. Effective analysis of rehabilitation treating stroke hemiplegia by CMT. Zhongyi Linchuang Yanjiu, 2016, 8(23): 81-82.

[18] Xu LW, Hu Z, Gao GY, Li YH, Guo TC, Li ML, Zhao XH, Yang XB. Effect and possible mechanism of intensive motor imagery therapy on the recovery of gait in hemiplegic stroke patients. Zhongguo Kangfu, 2016, 31(5): 345-348.

[19] Ma J, Yan XL, Huang J, Han ZP, Lu JL, Li H, Wang XF. Study on application of team rehabilitation model in secondary prevention and overall function rehabilitation of stroke. Zhonghua Wuli Yixue Yu Kangfu Zazhi, 2016, 38(12): 912-915.

[20] Zhang L, Shen W, Zhang HR. Effects of early rehabilitation intervention on motor function and ADL in patients with acute ischemic stroke. Hebei Yixue, 2016, 22(3): 369-372.

[21] Zhang XB, Meng ZX, Ma CC, Yin ZL, Wang JB. Observation on short-term effect of lower limbs rehabilitative robot plus motortherapy for lower limbs spasticity after stroke. Zhongguo Kangfu Yixue Zazhi, 2013, 28(5): 449-451.

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