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Article

Self-made Chinese herbal compound decoction on the frequency of attacks and symptom improvement in patients with external contraction limb joint spasms

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Abstract: Background: After suffering a stroke, external contraction limb joint spasms frequently occur as a sequela, leading to increased muscle tension in patients and affecting the normal control of contraction and relaxation of limbs and joints, significantly impacting their daily activities and productivity. Current clinical treatments often rely on surgery or anti-spasm medications, which may be accompanied by prolonged treatment durations and significant side effects. These methods only provide short-term relief from muscle tension and spasms, falling short of satisfactory results. Therefore, there is an urgent need to explore effective biomechanical therapies to alleviate limb joint spasms. Traditional Chinese medicine, with its unique theoretical framework and treatment modalities, has garnered global attention. This study aims to investigate the impact of a self-made traditional Chinese medicine compound decoction on the frequency of attacks and symptom improvement in patients suffering from external contraction limb joint spasms, hoping to offer additional avenues for the development of traditional Chinese medicine in treating limb joint spasms. **Objective**: To evaluate the biomechanical effects of the self-formulated Chinese medicine compound decoction on the frequency of attacks and symptom improvement in patients with external contraction limb joint spasms. **Methods**: A total of 94 patients with external contraction limb joint spasms following stroke were randomly allocated into two groups: the traditional Chinese medicine (TCM) group and the rehabilitation group, each consisting of 47 patients. The rehabilitation group received routine symptomatic treatment for stroke and biomechanical rehabilitation training, while the TCM group received the self-formulated Chinese medicine compound decoction in addition to routine treatment and rehabilitation training. Both groups underwent continuous treatment for one month. The number of limb joint spasm attacks before and after treatment was recorded for both cohorts. Comparisons were made regarding the degree of joint spasm at the elbow, wrist, knee, and ankle joints, clinic spasticity index (CSI) scores, Fugl-Meyer assessment (FMA) scale scores, and activities of daily living (ADL) scores between the two cohorts before and after treatment. Clinical efficacy was also compared between the two groups. **Results**: No significant difference was detected in the number of limb joint spasm attacks between the two groups before treatment ($P > 0.05$). After treatment, the number of attacks in both groups significantly decreased compared to before treatment ($P < 0.05$), with a lower number of attacks in the TCM group ($P < 0.05$). Prior to treatment, there were no statistically significant disparities in the degree of spasm at the elbow, wrist, knee, and ankle joints between the two cohorts ($P > 0.05$). Following treatment, notable improvement was observed in the spasm of each joint in both groups, with better improvement in the TCM group than in the rehabilitation cohort ($P < 0.05$). Before treatment, we found no substantial disparities in tendon reflex, muscle tension, and spasm scores between the two groups ($P > 0.05$). After treatment, scores in each parameter were reduced in both cohorts, with scores lowered in the TCM group compared to the rehabilitation group ($P < 0.05$). Prior to treatment, no substantial differences existed in FMA and ADL scores between the two groups ($P > 0.05$). After treatment, both FMA and ADL scores were elevated in both groups compared to before treatment, with higher scores observed in the TCM cohort than in the rehabilitation cohort ($P < 0.05$). The total effective rate in the TCM group reached 95.74%, while in the rehabilitation group, it was 80.85%, with significantly higher clinical efficacy in the TCM group compared to the rehabilitation cohort ($P < 0.05$). **Conclusion**: The use of self-formulated Chinese medicine compound decoction can reduce the number of attacks and achieve a more significant improvement in symptoms for the treatment of external contraction limb joint spasms, demonstrating good biomechanical therapeutic value and deserving clinical promotion.

Keywords: traditional Chinese medicine; compound decoction; joint spasm; number of attacks; symptoms; improvement; evaluation of biomechanical effects

1. Core tip

During our investigation, prospective grouping research was implemented on external contraction limb joint spasm patients, probing into the combined effect of conventional rehabilitation treatment with self-formulated TCM compound decoction in patients with limb joint spasms following stroke. The findings reflected that vis-à-vis conventional rehabilitation therapy alone, this modality conspicuously lessens the number of spasm attacks, ameliorates spasm symptoms, and bolsters patients' daily life abilities. It stands as an efficacious strategy for treating extremity joint spasms.

2. Introduction

Stroke, known as a cerebrovascular disease characterized by sudden rupture or blockage of brain blood vessels leading to brain tissue damage, ranks as the third primary contributor to human death, following only malignant tumors and ischemic heart disease (IHD) [1–3]. It not only carries a high mortality rate but also culminates in a high rate of disability among survivors, being a significant contributor to long-term disabilities in humans [4]. Studies have revealed that approximately 4% to 42.6% of stroke patients experience spasms, with 2% to 13% potentially causing severe disabilities [5,6]. As one of the prevalent sequelae following stroke, patients suffering from limb joint spasms may be confronted with issues such as pain, augmented muscle tension, ankylosis, joint deformities, tissue contractures, and restricted movement. Patients struggle to control the contraction and relaxation of muscles and joints independently, influencing not only their own health and daily life activities such as dressing, eating, washing, and sitting properly but also increasing the burden on their families, medical institutions, and society [7]. Therefore, it is essential to control and treat limb joint spasms in individuals with stroke during the rehabilitation process.

At the current stage, there is no specific therapy or medication for treating limb joint spasms post-stroke. Conventional treatment modalities mainly emphasize attenuating the frequency of spasms, alleviating risk factors, and relieving the severity of spasms [8]. Physical therapy, exercise therapy, drug therapy, and surgical treatment stand as the most prevalent conventional treatment approaches [9–11]. However, in real-world scenarios, achieving the desired spasm control remains challenging due to various factors, including the adverse effects of medication, the invasive nature of some treatments, and the financial strain on patients, despite the use of multiple therapeutic approaches. Hence, it is crucial to search for new treatment regimens for limb joint spasms that are non-invasive, cost-effective, safe, and effective. Based on this, this research focuses on patients with limb joint spasms admitted to our hospital, investigating the impact of self-made TCM compound decoction on the frequency of spasms and the amelioration of symptoms, seeking to provide safer and more effective treatment options for patients with limb joint spasms.

3. Clinical data

3.1. General data from research objects

Ninety-four patients with limb joint spasms post-stroke, admitted to our hospital during the period between January 2022 and December 2023, were selected as the subjects of this experiment. They were assigned into two cohorts, the TCM cohort and the rehabilitation cohort, using a fully randomized envelope method, with 47 individuals in each group. Researchers encompassed 25 males and 22 females in the TCM group, with ages ranging from 35 to 70 years, yielding an average age of (41.03 ± 5.66) years. The rehabilitation group incorporated 23 males and 24 females, whose ages ranged from 33 to 69 years, with an average age of (39.24 ± 4.81) years. This investigation adhered to the ethical principles outlined in the “Helsinki Declaration”.

3.2. Inclusion and exclusion criteria

Inclusion criteria: Patients diagnosed with external contraction limb joint spasms post-stroke confirmed by Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) examination; presenting symptoms including limb hemiplegia and heightened muscle tension; Brunnstrom stage II to IV, modified Ashworth scale grades 1 to 3; aged below 70 years; not administered muscle relaxants or sedatives within the past two weeks; and able to cooperate and complete the study with clear consciousness. Stroke onset within a specific duration post-event (within 6 months to 1 year to ensure homogeneity in the patient cohort and to assess the effect of the intervention within a relevant timeframe).

Exclusion criteria: Patients with limb joint spasms due to other causes; no significant dysfunction of vital organs such as heart, liver, or kidneys; concurrent malignant tumors; concomitant autoimmune diseases, endocrine system diseases, hematological disorders; cognitive impairment or mental illness; history of transient cerebral ischemic attacks, subarachnoid hemorrhage, traumatic brain damage, cerebral parasitic diseases, or craniocerebral trauma; participants involved in other research experiments within three months or receiving other relevant treatments or using prohibited therapies during this study, potentially interfering with study outcomes; poor compliance, non-cooperation with treatment, or premature withdrawal.

4. Treatment methods

4.1 Rehabilitation group

Forty-seven patients in the rehabilitation cohort were subjected to routine symptomatic treatment for stroke and rehabilitation training. This encompassed maintaining blood pressure, blood sugar, and blood lipids, administering neuroprotective, anti-platelet aggregation, intravenous thrombolysis, and fluid infusion, providing psychological counseling to help patients alleviate mental burden, build confidence, and actively cooperate with treatment. Rehabilitation training utilized neurodevelopment treatment (NDT) approaches such as Bobath, Brunnstrom, Roed techniques, and occupational therapy (OT) [12], intending to suppress upper limb spasms, finger flexion spasms, lower limb spasms, and perform dorsiflexion training on the ankle joint. Tailored training methods were selected based on the specific condition of the patient's limb joint spasms, emphasizing individualized treatment, and employing a one-on-one approach. Treatment modalities were adjusted promptly based on improvements in the patient's functional status, with 1–2 training approaches chosen for each affected area. Each training session lasted for 50 minutes, conducted three times a week with a one-day interval, totaling four weeks of training.

4.2. TCM group

As for the TCM cohort, consisting of forty-seven patients, researchers added a *self-made TCM compound decoction to conventional treatment and rehabilitation training for the TCM group. The rehabilitation training regimen was identical to that of the rehabilitation cohort. The composition of the self-formulated TCM compound decoction encompassed: Dipsaci radix (Xuduan in Chinese), Eucommiae cortex (Duzhong), Sophorae radix (Fangfeng), Angelicae pubescentis radix (Duhuo), Gentianae macrophyllae radix (Qinjiao), Angelicae sinensis radix (Danggui), Chuanxiong rhizoma (Chuanxiong), Taxilli herba, and Corydalis rhizoma (Yanhusuo), each at 15 grams. One dose was prepared daily by decocting the herbs in 400 mL of water, divided into morning and evening doses for consumption.*

Both cohorts were monitored for effects following one month of continuous treatment.

5. Observation of indicators and statistics

5.1. Number of attacks

The occurrences of limb joint spasms were documented before and aftertreatment in both cohorts of patients.

5.2. Degree of joint spasms

The degree of joint spasms in the elbow, wrist, knee, and ankle joints was subjected to comparisons before and after treatment in both groups. The degree of elbow joint spasm was determined by the angle between the extension line of the radius and the extension line of the humerus when the forearm flexed internally. The degree of wrist joint spasm was confirmed by the angle between the extension line of the second metacarpal bone and the radius when spasms occurred. Using the vertical position of the fibula and femur as a reference, the degree of knee joint spasm was ascertained by the maximum angle between the fibula and the reference line when the patient flexed the knee. The degree of ankle joint spasm was gauged by the angle between the planta pedis and the reference line, with the angle between the horizontal plane and the vertical line at the lateral malleolus when the patient was in a supine position adopted as the reference.

5.3. Evaluation of spasms [13], limb motor function, and activities of daily living

The clinic spasticity index (CSI) was taken for the assessment of the spasm condition of patients, including three dimensions, namely tendon reflexes (0~4 points), muscle tension (0~8 points), and spasms (0~4 points), totaling 16 points. Scores ranging from 0 to 9 suggested mild spasms, 10 to 12 denoted moderate spasms, and 13 to 16 reflected severe spasms. A higher score signified a more severe degree of spasms.

With the assistance of the Fugl-Meyer assessment (FMA) scale, the limb motor function of patients underwent evaluations via a 3-level scoring system, with a total score of 100 points (66 points for the upper limbs and 34 points for the lower limbs). Scores below 50 indicated severe motor impairment, 50 to 84 denoted evident motor impairment, 85 to 95 reflected moderate motor impairment, and 96 to 99 signified mild motor impairment. The higher the score, the better the limb motor function.

The activities of daily living (ADL) scale were harnessed for the evaluation of patients' ability to perform daily activities, encompassing dressing, eating, bathing, grooming, controlling bowel movements, controlling urination, toileting, transfer between bed and chair, walking, and stair climbing. The total score was set at 100 points, with scores below 20 reflecting complete disability, 20 to 40 indicating moderate functional impairment, 40 to 60 suggesting moderate functional impairment, and scores above 60 signifying basic self-care abilities. A higher score symbolized stronger daily living abilities.

5.4. Clinical therapeutic effect

Based on the reduction of muscular tension in patients, efficacy assessment criteria were established. If muscle tension was attenuated to grade 0, it was considered a cure; if muscle tension decreased by 2 grades or more, it suggested marked effectiveness; if muscle tone was lowered by 1 grade, it denoted effectiveness; if the decrease in muscle tension was less than 1 grade or there was no dramatic improvement, it was considered ineffective. The total effective rate was calculated as the sum of the cure rate, marked effectiveness rate, and effective rate.

5.5. Statistical analysis

Via SPSS22.0 software, all data in this study underwent processing and analysis, with measurement data represented as ($\bar{x} \pm s$). Comparisons were made between cohorts through paired *t*-tests. Within-group comparisons before and after treatment were subjected to analysis via paired *t*-tests. Enumeration data were displayed as percentages, with comparisons implemented through the χ^2 test. $P < 0.05$ denoted statistically significant disparities.

6. Results

6.1. General data of patients from the two groups

The TCM group contained 25 male and 22 female individuals, aged between 35 and 70 years, with an average age of (41.03 ± 5.66) years and an average duration of disease of (5.35 ± 0.87) weeks. Stroke types included 38 cases of cerebral hemorrhage and 9 cases of cerebral infarction. Within the rehabilitation cohort, there were 23 male and 24 female patients, whose ages ranged between 33 and 69 years, with an average age of (39.24 ± 4.81) years, as well as an average duration of disease of (5.32 ± 0.82) weeks. Stroke types incorporated 35 cases of cerebral hemorrhage and 12 cases of cerebral infarction. No statistically significant divergence was confirmed in general data between the two cohorts ($P > 0.05$), as exhibited in **Table 1**. This finding demonstrated that the baseline data of the two groups were balanced and comparable, with minimal impact on subsequent research.

Table 1. Comparison of general data in the two groups ($\bar{x} \pm s$, n).

Item		**TCM group (*n* = 47)**	**Rehabilitation group (*n* = 47)**	χ^2/t	***P* value**
Age (years)		41.03 ± 5.66	39.24 ± 4.81	1.652	0.102
Gender (n)				0.170	0.670
	Male	25	23		
	Female	22	24		
Duration of disease (week)		5.35 ± 0.87	5.32 ± 0.82	0.173	0.863
Types of stroke (n)				0.552	0.458
	Cerebral hemorrhage	38	35		
	Cerebral infarction	9	12		

6.2. Number of attacks in the two groups before and after treatment

Prior to treatment, there existed no noticeable differences in the number of limb joint spasms between the two cohorts ($P > 0.05$). Post-treatment, the number of spasms in the TCM cohort attained (1.63 ± 0.24) times per week, which was lower than that within the rehabilitation cohort (2.08 ± 0.33) times per week, with statistical significance ($P < 0.05$). Refer to **Table 2**. Our discoveries unveiled that self-made TCM compound decoction showed superior efficacy to conventional rehabilitation treatment in terms of attenuating the number of spasm attacks in patients suffering from limb spasms.

Table 2. Comparison of the number of limb joint spasm attacks between the two groups before and after treatment ($\bar{x} \pm s$, times/week).

Group	**TCM group (*n* = 47)**	**Rehabilitation group (*n* = 47)**	***t***	***P* value**
Preceding treatment	6.12 ± 0.53	6.10 ± 0.49	0.190	0.850
Following treatment	1.63 ± 0.24	2.08 ± 0.33	7.561	<0.001

6.3. Joint spasticity before and after treatment in both groups

Before treatment was initiated, we found no statistically significant divergence in the spasticity of elbow, wrist, knee, and ankle joints between the two cohorts (P > 0.05), whereas, after the completion of treatment, the spasm degree of all joints of both groups underwent dramatic improvement, with the spasticity of the elbow joint of the TCM group (14.41 ± 1.27)°, the spasticity of the wrist joint (11.27 ± 1.23)°, the spasticity of the knee joint (21.25 ± 3.05)°, and the spasticity of the ankle joint (10.64 ± 1.33)°, all lower than those within the TCM group during the same time period, with statistically significant differences confirmed (P < 0.05). See **Table 3**. All the above outcomes unraveled that the treatment of patients with external contraction limb joint spasms with self-prepared TCM compound decoction efficaciously relieved the spasms of the elbow, wrist, knee, and ankle joints of the patients, alleviating joint spasms and defending joint functions.

Table 3. Comparison of joint spasticity between the two groups before and after treatment ($\bar{x}$ ± s, °).

		TCM group (*n* = 47)	**Rehabilitation group (*n* = 47)**	***t***	***P***
Elbow joint	Before treatment	48.55 ± 5.34	48.39 ± 5.66	0.141	0.888
	Following treatment	14.41 ± 1.27*	26.78 ± 2.48*	30.437	<0.001
Wrist joint	Before treatment	35.02 ± 3.57	35.08 ± 3.66	0.080	0.936
	Following treatment	11.27 ± 1.23*	19.13 ± 2.05*	22.540	<0.001
Knee joint	Before treatment	55.41 ± 4.38	55.29 ± 5.11	0.122	0.903
	Following treatment	21.25 ± 3.05*	30.96 ± 3.77*	13.728	<0.001
Ankle joint	Before treatment	40.83 ± 4.86	41.17 ± 4.28	0.360	0.720
	Following treatment	10.64 ± 1.33*	21.39 ± 2.07*	29.953	<0.001

Note: versus the levels prior to treatment, $^*P$ < 0.05.

6.4. CSI indexes in both groups before and after treatment

Prior to the initiation of treatment, no remarkable difference was determined between the two cohorts in terms of tendon reflex, muscle tone, and clonus scores (P > 0.05). Nevertheless, following treatment, all the scores of the two groups were lowered. Specifically, the tendon reflex score of the TCM group reached (1.23 ± 0.15), muscle tension attained (3.27 ± 0.38), and clonus reached (2.01 ± 0.22), which were all lower than those of the same period of time within the rehabilitation cohort, with statistically significant differences noticed (P < 0.05). See **Table 4**. This confirmed that all CSI scores were significantly improved, and the severity of spasms was greatly relieved post-treatment within the TCM group of patients treated with self-made TCM compound decoction.

Table 4. Comparison of CSI indexes in both groups preceding and following treatment ($\bar{x}$ ± s, points).

		TCM group (*n* = 47)	**Rehabilitation group (*n* = 47)**	***t***	***P***
Tendon reflex	Before treatment	2.85 ± 0.36	2.88 ± 0.31	0.433	0.666
	After treatment	1.23 ± 0.15*	1.97 ± 0.20*	20.293	<0.001
Muscle tension	Before treatment	6.18 ± 0.76	6.14 ± 0.71	0.264	0.793
	After treatment	3.27 ± 0.38*	4.45 ± 0.42*	14.283	<0.001
Clonus	Before treatment	3.29 ± 0.33	3.26 ± 0.31	0.454	0.651
	After treatment	2.01 ± 0.22*	2.88 ± 0.27*	17.125	<0.001

Note: compared to the levels prior to treatment, $^*P$ < 0.05.

6.5. FMA and ADL scores in both groups before and after treatment

The ratings of FMA and ADL serve as pivotal measures for gauging patients' limb mobility and daily living capacities [14,15]. Pre-treatment, both FMA and ADL ratings within the two cohorts showed no marked differences ($P > 0.05$). Post-treatment, both groups exhibited heightened FMA and ADL ratings compared to pre-treatment levels. In the TCM cohort, FMA scores attained (78.94 ± 8.82) points, higher than those within the rehabilitation group (65.41 ± 7.11) points, whereas ADL scores reached (77.94 ± 7.98) points, surpassing those in the rehabilitation cohort (65.81 ± 7.03) points, with statistically significant disparities ($P < 0.05$), as depicted in **Table 5**. Our data reflected that the TCM compound decoction remarkably bolstered patients' limb functionality and quality of daily life when treating limb joint spasms caused by external contraction, aiding in postoperative recovery and facilitating a swift return to normal life.

Table 5. Comparison of FMA and ADL ratings between the two groups pre- and post-treatment ($\bar{x} \pm s$, points).

		TCM group (*n* = 47)	**Rehabilitation group (*n* = 47)**	***t***	***P***
FMA	Pre-treatment	31.54 ± 3.02	31.60 ± 3.78	0.085	0.932
	Post-treatment	78.94 ± 8.82*	65.41 ± 7.11*	8.793	<0.001
ADL	Pre-treatment	41.66 ± 4.94	42.08 ± 3.75	0.464	0.644
	Post-treatment	77.94 ± 7.98*	65.81 ± 7.03*	7.819	<0.001

Note: versus the pre-treatment levels, $^*P < 0.05$.

6.6. Clinical efficacy in both groups

Following treatment, the TCM cohort contained 21 cases that achieved full recovery, 13 cases with marked effectiveness, 11 with effectiveness, and 2 with no improvement. The overall clinical effective rate within the TCM group attained 95.74%, whereas in the rehabilitation cohort, it stood at 80.85%. The clinical efficacy of the TCM cohort was notably higher than that of the rehabilitation cohort, with statistically significant differences ($P < 0.05$), as illustrated in **Table 6**. Our findings demonstrated that vis-à-vis rehabilitation therapy, self-prepared TCM compound decoctions yielded superior clinical efficacy in treating limb joint spasms triggered by external factors.

Table 6. Comparison of clinical efficacy between the two groups (*n*, %).

	TCM group (*n* = 47)	**Rehabilitation group (*n* = 47)**	χ^2	***P***
Cure	21 (44.68)	10 (21.28)		
Marked effectiveness	13 (27.66)	16 (34.04)		
Effectiveness	11 (23.40)	12 (25.53)		
No effectiveness	2 (4.26)	9 (19.15)		
Total effective rate	45 (95.74)	38 (80.85)	5.045	0.025

7. Discussion

Stroke, known as the most prevalent type of cerebrovascular disease, has several characteristics such as high mortality, recurrence, and disability rates, posing significant risks to patients' lives and health, as well as their quality of life [16]. Limb joint spasms are common sequelae in the wake of stroke, characterized by involuntary muscle contractions and heightened speed-dependent stretch reflexes, leading to motor impairments. Clinical manifestations include augmented muscle tone, hyperactive tendon reflexes, and substantial impairment of upper and lower extremity functions, with notable limitations in joint mobility [17]. Without timely intervention, persistent spasticity impedes the restoration of normal movement patterns, greatly affecting patients' daily lives. Due to the predominant innervation areas of peripheral nerves in the upper and lower limbs and the differing modes of muscle action, post-stroke limb joint spasm patients often exhibit a coordinated movement pattern of upper limb flexors and lower limb extensors. Specifically, on the affected side, the upper limb displays flexor-dominant flexion spasms, while the lower limb exhibits extensor-dominant tonic spasms. This not only generates a sense of pain but also influences the patient's sleep, mood, and mental state [18]. Therefore, early management of spasticity is crucial for the recovery of post-stroke limb function among patients.

Presently, Western medical treatments for limb joint spasms primarily encompass pharmaceutical interventions such as baclofen, and creotoxin, as well as physical therapies like thermotherapy and electrical stimulation therapy, along with surgical treatments such as orthomorphia and neurosurgery [19,20]. Fiore et al. [21] have reported that muscle injection of a novel formulation of botulinus toxin type A, NT201, efficaciously alleviates upper limb spasms post-stroke, presenting as a viable and well-tolerated long-term treatment option that substantially improves functional disability, muscle hypertonia, and daily spasticity. TCM offers markedly distinct understandings and treatment approaches for limb joint spasms, commonly employing Chinese herbal decoctions, acupuncture, cupping, massage therapy, and rehabilitation exercises, all of which have shown promising clinical efficacy [22,23]. Hao et al. [24] have discovered that an intelligent rehabilitation training system is beneficial in ameliorating spasticity in hemiplegic stroke individuals, enhancing their balance, motor skills, and activities of daily living, contributing to favorable rehabilitation outcomes.

In this investigation, based on rehabilitation therapy, the impact of self-prescribed TCM compound decoctions on the frequency and improvement of symptoms in limb joint spasms triggered by external factors was probed. The outcomes confirmed that following treatment with different regimens, both cohorts displayed improvements in spasm frequency, joint spasm severity, CSI, FMA, and ADL scores compared to before treatment. As opposed to the rehabilitation group, the TCM group exhibited fewer spasm occurrences, lower degrees of spasm in the elbow, wrist, knee, and ankle joints, lower scores in tendon reflexes, muscle tone, and spasms, higher FMA and ADL scores, with a clinical effective rate of 95.74%, significantly higher than the rehabilitation group's 80.85% ($P < 0.05$). This bears similarity to previous findings regarding the spasm-relieving effects of TCM decoctions. Zhu et al. [25] have unraveled that the Chinese herbal formula "Trichosanthes and Cinnamon Twig Decoction" dramatically ameliorated neurological defects and stroke in rats with middle cerebral artery occlusion, bolstering their motor abilities, upregulating GABAB receptor expressions in the ischemic cerebral cortex, alleviating stroke spasms, and exerting neuroprotective and spasm-relieving functions. Wang et al. [26] have also denoted that "Peony and Licorice Decoction" can ameliorate post-stroke spastic paralysis in a rat model, reducing muscle tone, modulating neurotransmitter system balance, improving neural status, and exerting muscle-strengthening and spasm-relieving effects. The self-made TCM compound decoction in this research was composed of medicinal herbs such as *Dipsaci radix* (Xuduan), *Eucommiae cortex* (Duzhong), *Sophorae radix* (Fangfeng), *Angelicae pubescentis radix* (Duhuo), *Gentianae macrophyllae radix* (Qinjiao), *Angelicae sinensis radix* (Danggui), *Chuanxiong rhizoma* (Chuanxiong), *Taxilli herba* (Jisheng), and *Corydalis rhizoma* (Yanhusuo), each possessing various pharmacological effects. For example, Xuduan, Qinjiao, and Yanhusuo exhibit functions of being hemostatic, analgesic, sedative, anti-inflammatory, purulent discharge-promoting, and tissue regeneration-promoting. Duzhong and Jisheng have functions of expelling wind-dampness, nourishing the liver and kidneys, and strengthening tendons and bones. Fangfeng and Duhuo boast multiple pharmacological functions such as antipyretic, sedative, analgesic, antispasmodic, antiallergic, and anti-platelet aggregation. Danggui and Chuanxiong have effects like antipyretic, sedative, anti-myocardial ischemia, antithrombus, coronary artery and vascular dilation, and improvement of peripheral circulation. When combined, these herbs not only fundamentally improve the patient’s cerebral circulation, and promote stroke recovery, but also help promote blood circulation in the affected area, reduce smooth muscle tension, relax muscles and joints, and restore limb joint function, thereby achieving the goal of relieving limb joint spasms [27,28], vigorously attenuating the frequency of spasms, ameliorating spasm symptoms, and boosting treatment efficacy.

This research demonstrated the effectiveness of self-prescribed Chinese herbal compound decoctions combined with rehabilitation therapy in improving limb joint spasms in the wake of stroke, but it also shows certain limitations. For instance, the relatively small sample size may limit the generalizability of the findings. Future studies will seek to increase the sample size to further validate the efficacy of self-made TCM compound decoctions coupled with rehabilitation therapy in mitigating limb joint spasms caused by external contraction. Additionally, the study lacks long-term follow-up investigations of patients and does not deeply explore the medium to long-term efficacy of this regimen in improving external contraction limb joint spasms. Subsequent research will extend the follow-up period to conduct further investigations and address these shortcomings.

8. Conclusion

In summation, for the treatment of external contraction limb joint spasms, the use of self-prepared TCM compound decoctions can evidently abate the frequency of spasms, achieve remarkable improvement in symptoms, and enhance daily life and motor abilities for affected individuals. This approach holds considerable value in the treatment of limb joint spasms triggered by external factors and is worthy of clinical promotion.

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