

Clinical Observation on the Efficacy of Hot Wax Therapy Combined with Acupotomy in the Treatment of Stage I Shoulder-Hand Syndrome

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Abstract: *Objective:* To compare the clinical efficacy differences among hot wax therapy, acupotomy therapy, and their combined regimen in treating Stage I shoulder-hand syndrome (SHS). *Methods:* A total of 60 post-stroke SHS Stage I patients admitted to the Rehabilitation Department of Zhungeer Banner Hospital of Traditional Chinese and Mongolian Medicine from December 2024 to December 2025 were selected and randomly assigned to three groups: the hot wax group, the acupotomy group, and the combination group, with 20 patients in each group. The hot wax group received hot wax therapy combined with conventional rehabilitation; the acupotomy group received acupotomy release combined with conventional rehabilitation; and the combination group received both hot wax therapy and acupotomy release along with conventional rehabilitation. The treatment course for all groups was 4 weeks. The Visual Analogue Scale (VAS), Edema Evaluation Score (EES), and Fugl-Meyer Assessment (upper limb motor function) scores were compared among the three groups before treatment, after 2 weeks, and after 4 weeks of treatment. *Results:* After 4 weeks of treatment, all three groups showed significant reductions in VAS and EES scores and significant improvements in Fugl-Meyer upper limb motor function scores compared to before treatment ($P < 0.05$). Inter-group comparisons revealed that the improvement in all outcome measures in the combination group was significantly greater than that in the hot wax group and the acupotomy group after both 2 weeks and 4 weeks of treatment ($P < 0.05$). Furthermore, the acupotomy group demonstrated superior pain relief and edema reduction compared to the hot wax group ($P < 0.05$). *Conclusion:* The combination of hot wax therapy and acupotomy is more effective in alleviating pain and edema, and in promoting the recovery of upper limb motor function and activities of daily living in Stage I SHS patients, compared to either therapy alone or conventional rehabilitation. It represents a safe and effective comprehensive treatment approach.

Keywords: Shoulder-hand syndrome; Acupotomy; Hot wax therapy; Rehabilitation

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1. Introduction

Shoulder-hand syndrome (SHS), also known as complex regional pain syndrome type I, is a common complication after stroke, with an incidence rate as high as 12.5–70.0%^[1]. Stage I (acute stage) is characterized by sudden pain, swelling, increased skin temperature, and limited joint movement in the affected shoulder and hand. If timely and effective intervention is not provided at this stage, it can rapidly progress to stage II (dystrophic stage) and stage III (atrophic stage), leading to hand muscle atrophy, joint contracture deformity, serious damage to upper limb function, and affecting the overall rehabilitation process and quality of life^[2]. At present, clinical treatment for SHS stage I mostly uses comprehensive rehabilitation methods, including good limb positioning, concentric compression wrapping, active and passive joint range of motion training, physical factor therapy (such as transcutaneous electrical nerve stimulation, ultrasound), and drugs. Although these methods have certain efficacy, for some patients, especially those with significant edema and pain, the onset of action is slow and the effect is limited^[3]. Therefore, exploring intervention programs with faster onset and more accurate efficacy is an important issue in rehabilitation clinical practice. Hot wax therapy and acupuncture therapy are both commonly used physical and minimally invasive treatments in the field of pain rehabilitation. Acupotomy therapy is a minimally invasive technology that combines the characteristics of the “needle” of traditional Chinese medicine and the “knife” of Western medicine surgery. It can accurately loosen local adhesions and contracted fascia and soft tissues, effectively reduce intra-tissue pressure, relieve neurovascular compression, quickly relieve pain, and break the vicious cycle of “pain-spasm-ischemia”^[4]. Hot wax therapy utilizes the thermal, mechanical, and chemical effects of molten paraffin. Its large heat capacity and low thermal conductivity allow heat to penetrate into tissues persistently and evenly. It has the effects of significantly improving local blood circulation, promoting lymphatic return, eliminating edema, relieving pain, and softening tissues^[5]. Based on this, this study innovatively combines the “sharp release” of acupuncture with the “deep warming” of hot wax, aiming to exert a synergistic effect and intervene in the core pathological links of SHS stage I. Provide new treatment ideas and a basis for clinical formulation of stepped and precise treatment plans.

2. Clinical data

2.1. General information

Sixty patients with SHS stage I admitted to the rehabilitation department of our hospital from December 2024 to December 2025 were selected. The patients were randomly divided into three groups by the random number table method: hot wax group, acupotomy group, and combination group, with 20 cases in each group. There were no statistically significant differences in baseline data such as gender, age, disease duration, and primary disease type among the three groups of patients ($P > 0.05$), and they were comparable. This study was approved by the hospital Ethics Committee (Approval No.: Z20250009), and all patients signed the informed consent form.

2.2. Diagnostic criteria

Refer to the diagnostic criteria of the *Chinese Guidelines for Early Rehabilitation Treatment of Stroke*^[6]. Has a clear history of cerebrovascular disease; Stage I is characterized by pain and limited movement in the affected shoulder, often accompanied by pain in the ipsilateral finger and wrist joints. The fingers are mostly in a mildly flexed position, and the flexed movement is limited. The pain intensifies during passive flexed

movements. The hands are swollen and the color has changed.

2.3. Inclusion criteria

Meet the above-mentioned diagnostic criteria for SHS stage I; Aged 40 to 75; The first onset of the disease, with a course of less than 6 weeks; Vital signs are stable, consciousness is clear, and the patient can cooperate with treatment and assessment. Sign the informed consent form.

2.4. Exclusion criteria

SHS Stage II or Stage III; There is a fracture in the affected upper limb and chronic diseases in the shoulder in the past, such as gouty arthritis, periartthritis of the shoulder, and shoulder (semi) dislocation, etc. There is severe insufficiency of heart, liver, kidney, and other organ functions or coagulation dysfunction; Have cognitive impairment or mental illness and be unable to cooperate; Allergic to paraffin. Mistakenly included in the group criteria; The treatment was not received in accordance with the procedures stipulated in the research protocol.

2.5. Withdrawal

Patients who withdraw on their own during the treatment period; Adverse reactions related to treatment occur (such as skin burns, allergies, nerve damage, infections, etc.); During the treatment period, if there is a recurrence of stroke, severe cardiovascular and cerebrovascular events or other disease progression, and the trial needs to be discontinued and transferred to emergency treatment; Those who develop other serious diseases during the research process and require priority treatment; Lost contact.

3. Treatment methods

All patients were given corresponding conventional stroke drugs, dietary therapy, care, and conventional rehabilitation treatment based on the primary disease and complications, including good limb positioning, active and passive joint range of motion training of the affected limb, centripetal massage, and health education.

3.1. Hot wax group

The hot wax therapy method uses an intelligent wax therapy machine. Medical paraffin with a melting point of 56°C is selected. The melted wax liquid is poured into an enamel plate to form a wax cake about 2 to 3 cm thick. When it cools to the point where it initially solidifies into a block (surface temperature 45 to 50°C), a small spatula is used to remove the wax block and apply it to the jianyu, jianliao, and ashi points. Then, it is wrapped with plastic sheeting and cotton pads to keep warm for 30 minutes. This is done once a day. Treat for 6 days and rest for 1 day, and continue the treatment for 4 weeks.

3.2. Acupotomy group

Position: For shoulder operations, adopt the upright sitting position; for wrist operations, choose the supine position. Positioning: Shoulder selection points: The doctor holds the affected upper limb to assist the patient in performing passive flexion, extension, abduction, adduction, internal rotation, external rotation, horizontal abduction, and horizontal adduction, etc., to the extent that the patient can tolerate pain. When the patient feels pain, the doctor repeatedly presses around the shoulder of the affected limb and the upper

arm to find the most obvious tender point, or presses on the above areas to find the positive response point (tendon node). Select 2 to 4 points based on the patient's condition and mark them. Wrist point selection: The patient lies supine. At the ulnar edge of the flexor carpi radialis tendon in the transverse crease of the wrist on the distal side of the affected limb, 1–2 points are selected and marked according to the patient's condition. Needle: A disposable small needle knife from Jiangxi Laozongyi Medical Devices Co., LTD. (Gan Medical Device Registration No. 2017220027, specification 0.8 mm × 50 mm) is selected. Local anesthetic drugs: Take a 10 ml disposable sterile syringe to draw a mixed solution of 3 ml of 2% lidocaine injection and 1ml of Zhengqing Fengtongning Injection. Inject approximately 1ml at each application point. Specific operation: Shoulder: The operator should wash and disinfect their hands, wear a medical mask, instruct the patient to take a sitting or semi-reclining position, fully expose the skin, disinfect the operation site with iodophor, wear sterile gloves, and strictly follow the four-step needle insertion procedure of the needle knife to insert the needle, namely, fixed point, fixed direction, pressure, and insertion. The needle knife is inserted along the direction of the tendon and ligament's shape. After getting the breath, it is swung in a longitudinal direction for 3 to 4 cuts. Then, the blade direction is changed to be perpendicular to the muscle fiber direction for cutting. When there is a loose feeling in the hand, the needle knife can be pulled out. After the needle is removed, cover the wound with a band-aid and apply pressure to stop the bleeding for 1 minute. After the needle-knife treatment is completed, manual release should be performed. Slowly flex the shoulder joint forward, abduction, adduction, internal rotation and external rotation 2 to 3 times. The technique should be gentle and passive movement should be within the patient's tolerance range. Wrist: The disinfection method is the same as above. According to the four-step operation procedure of the acupotomy, insert the needle perpendicularly at the inner edge of the flexor carpi radialis tendon at the transverse crease of the wrist on the distal side of the affected wrist. The incision line should be parallel to the direction of the tendon's movement. The insertion depth should be approximately 0.5 cm. When a sense of hollow drop appears under the knife, switch to slow insertion. Make 3–4 longitudinal clear cuts and then swing laterally to separate the adhesions. After the needle is removed, cover the wound with a band-aid and apply pressure to stop the bleeding for 1 minute. After the needle-knife treatment is completed, 5 to 6 times of multi-angle and rotating wrist joint manipulation should be supplemented. Course of treatment: Once a week for 4 consecutive weeks.

3.3. Combination group

On the basis of conventional rehabilitation, the above-mentioned hot wax therapy and acupotomy therapy are combined. Wax therapy is not allowed on the day of acupotomy treatment. The interval should be at least 24 hours. The frequency and parameters of treatment were the same as those of the respective single-use groups.

4. Observation indicators and statistical methods

4.1. Observation indicators

4.1.1. Pain severity

The visual analogue scale (VAS) was adopted for assessment before treatment, at 2 weeks, and 4 weeks after treatment. A 10-cm horizontal straight line was used, with the leftmost end (0 cm) marked as no pain and the rightmost end (10 cm) marked as the worst imaginable pain. Patients placed a single mark on the line according to their overall current painful sensation to indicate pain intensity, and the scale value corresponding to the mark was recorded as the score. Scores ranged from 0 to 10 points; higher scores represented more severe pain.

4.1.2. Degree of edema in the affected hand

Before treatment, 2 weeks after treatment, and 4 weeks after treatment, the scores were 0, 2, 4, and 6 respectively for no edema, edema only limited below the wrist joint (near the metacarpophalangeal joint), edema spreading above the wrist joint, depression at the wrist joint, and edema throughout the upper limb.

4.1.3. Upper limb motor function

Before treatment, 2 weeks after treatment, and 4 weeks after treatment, the Upper Limb Simplified Fugl-Meyer Assessment Scale (FMA-UE) was used for evaluation. This scale contains 33 items in 10 aspects such as reflexes, shoulders, elbows, wrists, and hands. Each item was scored as uncompleted, partially completed, and fully completed with scores of 0, 1, and 2 respectively. The sum of the scores of each item was the total score. The total score ranges from 0 to 66 points. The higher the score, the better the upper limb motor function.

4.2. Statistical methods

Statistical analyses were performed using SPSS 26.0 software. Measurement data were expressed as mean $\pm$ standard deviation (SD). For data satisfying normal distribution and homogeneity of variance, one-way analysis of variance (ANOVA) was used for intergroup comparisons; repeated-measures ANOVA was applied to comparisons at different time points within groups, and the LSD-*t* test was adopted for pairwise comparisons. Enumeration data were presented as case number (percentage [%]), and the χ^2 test was utilized. A $P < 0.05$ was considered statistically significant.

4.3. Safety observation

Adverse reactions occurring during treatment were recorded, including bleeding, hematoma, and infection at acupotomy sites as well as scald induced by hot wax therapy.

5. Results

5.1. Comparison of VAS scores among the three groups before and after treatment

Before treatment, there was no statistically significant difference in VAS scores among the three groups ($P > 0.05$). At each follow-up time point after treatment, the VAS scores of all three groups decreased markedly compared with baseline ($P < 0.01$).

Intergroup comparison: At T1, the VAS scores of the acupotomy group and combination group were significantly lower than those of the hot wax group ($P < 0.05$); the combination group presented slightly lower scores than the acupotomy group without statistical differences ($P > 0.05$). At T2, the combination group had remarkably lower VAS scores versus the hot wax group and acupotomy group (all $P < 0.01$), and the acupotomy group was superior to the hot wax group ($P < 0.05$). These findings indicate that the combined regimen yields superior short- and long-term analgesic effects, and acupotomy exerts faster analgesic onset (see **Table 1**).

5.2. Comparison of affected limb edema scores among the three groups before and after treatment

No intergroup difference in edema scores was detected prior to treatment ($P > 0.05$). Edema scores of all groups were significantly reduced at each post-treatment time point relative to pretreatment ($P < 0.01$).

Intergroup comparison: At T1, edema scores in the acupotomy and combination groups were

significantly lower than the hot wax group ($P < 0.05$), whereas no difference existed between the acupotomy and combination groups. At T2, the combination group achieved significantly lower edema scores than the other two groups (all $P < 0.01$), and the acupotomy group outperformed the hot wax group ($P < 0.05$). It is demonstrated that the combined therapy achieves the optimal detumescence, and acupotomy produces better early detumescence than hot wax therapy (see **Table 1**).

5.3. Comparison of FMA-UE scores among the three groups before and after treatment

Baseline FMA-UE scores were comparable across three groups ($P > 0.05$). All groups obtained statistically elevated FMA-UE scores at each post-treatment time point compared with pretreatment ($P < 0.01$).

Intergroup comparison: No significant between-group difference was observed at T1 ($P > 0.05$). At T2, FMA-UE scores in the combination group were markedly higher than those in the hot wax group and acupotomy group (all $P < 0.01$), with no statistical discrepancy between the latter two groups ($P > 0.05$). The combined treatment possesses prominent long-term benefits in improving upper extremity functional recovery (see **Table 1**).

Table 1. Comparison of VAS scores, affected hand edema scores, and FMA-UE scores among three groups before and after treatment (mean $\pm$ SD, $n = 20$)

Group	Time	VAS (scores)	Degree of edema in the affected hand	FMA-UE
Hot wax	T0	7.3 $\pm$ 1.1	2.3 $\pm$ 0.5	29.5 $\pm$ 5.8
	T1	5.6 $\pm$ 1.0*	1.6 $\pm$ 0.6*	37.8 $\pm$ 6.2*
	T2	3.9 $\pm$ 0.9*	1.0 $\pm$ 0.4*	46.2 $\pm$ 6.5*
Acupotomy	T0	7.5 $\pm$ 1.2	2.4 $\pm$ 0.5	28.8 $\pm$ 6.1
	T1	4.4 $\pm$ 1.1* [△]	1.2 $\pm$ 0.5* [△]	39.2 $\pm$ 5.9*
	T2	3.2 $\pm$ 0.8* ^{△#}	0.8 $\pm$ 0.3* ^{△#}	48.9 $\pm$ 6.0*
Combined treatment	T0	7.4 $\pm$ 1.0	2.3 $\pm$ 0.6	30.1 $\pm$ 5.5
	T1	3.9 $\pm$ 0.9* [△]	1.1 $\pm$ 0.4* [△]	40.5 $\pm$ 5.7*
	T2	2.1 $\pm$ 0.7* ^{△#▲}	0.4 $\pm$ 0.3* ^{△#▲}	55.3 $\pm$ 5.4* ^{△#▲}

Notes: 1. T0: Before treatment; T1: 2 weeks after treatment; T2: 4 weeks after treatment. 2. Compared with T0 in the same group, * $P < 0.01$. 3. Compared with the hot wax group at the same time point, [△] $P < 0.01$. 4. Compared with the acupotomy group at the same time point, [▲] $P < 0.01$. 5. Comparison between T2 of the acupotomy group and T2 of the hot wax group, [#] $P < 0.05$.

5.4. Safety analysis

During the treatment, 2 patients in the observation group developed mild subcutaneous ecchymosis locally after acupotomy, which resolved spontaneously within 3 days without special intervention. One patient complained of a slight burning sensation during the first hot wax therapy due to sensory disturbance, and the symptom did not recur after adjusting the wax temperature. No obvious adverse reactions were reported in the control group. No severe adverse events such as infection, scald, or nerve injury occurred in either group.

6. Discussion

Shoulder-hand syndrome is one of the major disabling complications in patients with ischemic stroke, which severely hinders their early rehabilitation. Without timely intervention, the condition will progress, aggravate disability, and impair patients' activities of daily living. Its core pathogenesis lies in local

vasomotor dysfunction, aseptic inflammation, and obstructed lymphatic drainage caused by hyperactivity of the sympathetic nervous system, further resulting in severe pain, edema, and tissue nutritional imbalance^[7]. Stage I of SHS is the critical period for early intervention. Active treatment can prevent its progression to Stage II and Stage III, while effective clinical regimens remain to be optimized at present^[8].

This study adopted a three-group randomized controlled design to compare the efficacy of hot wax therapy, acupotomy, and their combination in the treatment of stage I SHS. The results showed that all three interventions could effectively relieve pain, reduce edema, and improve upper limb function. The combined group achieved significantly better improvements in all indicators than the two monotherapy groups, verifying the hypothesis of synergistic effects of combined treatment.

Analysis of efficacy trends revealed that at week 2 of treatment (T1), the acupotomy group and the combined group were markedly superior to the hot wax group in alleviating pain (VAS) and reducing edema (EES). It indicates that the mechanical release of acupotomy exerts an immediate effect on rapidly reducing tissue tension and internal pressure, and breaking the vicious cycle in the acute phase. As a pure physical therapy, hot wax therapy relies on the thermal effect to boost circulation and lymphatic drainage, which requires cumulative action and thus takes effect relatively slowly.

At the endpoint of week 4 (T2), the advantages of the combined group became fully evident, with the lowest VAS and EES scores and the highest FMA-UE scores. It suggests that the initial release by acupotomy creates a favorable mechanical environment for tissue repair. On this basis, the continuous warming and dredging effect of hot wax further optimizes local microcirculation and metabolism, and softens tissues. The sequential combination of the two therapies produces continuously amplified therapeutic effects and ultimately promotes the recovery of motor function more effectively.

In terms of mechanism, the pathological basis of stage I SHS includes neurogenic inflammation, excessive sympathetic nerve excitation, and microcirculation disturbance. By releasing lesioned fascia and soft tissues, acupotomy can not only directly reduce the transmission of pain signals but also regulate the tension-strain integrated structure of local soft tissues and modulate the excitability of sympathetic nerve terminals, thereby intervening in vasomotor disorders at the source.

The strong thermal effect of hot wax therapy can sustainably dilate blood vessels, accelerate blood flow, and enhance lymphatic pumping function. It flushes out inflammatory mediators released locally after acupotomy and efficiently removes interstitial fluid, thus consolidating and amplifying the anti-edema effect of acupotomy. The two therapies form a complete therapeutic cycle focusing on structural release and functional improvement respectively.

In terms of safety, the combined treatment does not raise major risks. Acupotomy is performed in strict accordance with aseptic techniques and anatomical principles, with operative sites avoiding major nerves and blood vessels to ensure safety. The temperature of the hot wax is well controlled. Measures such as temperature testing and shortened initial treatment duration effectively prevent scalds in patients with sensory impairment.

This study has several limitations. It is a single-center trial with a relatively small sample size and short follow-up duration, so the long-term efficacy of the combined therapy in preventing the progression of SHS to Stage II could not be observed. Further multi-center, large-sample randomized controlled trials with a follow-up period extended to 3 to 6 months are recommended. Additionally, objective imaging examinations such as ultrasonography and infrared thermography can be applied to further clarify the underlying mechanisms.

7. Conclusion

Combined hot wax therapy and acupotomy is a safe and effective treatment for Stage I SHS, offering superior improvement in pain, edema, upper limb motor function, and daily living activities compared to monotherapy or conventional rehabilitation.

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Disclosure statement

The authors declare no conflict of interest.

References

- [1] Zhao YZ, Sa R, 2025, Research Progress of Acupuncture and Moxibustion in the Treatment of Post-Stroke Shoulder-Hand Syndrome. *Marriage & Health*, 31(22): 106–108.
- [2] Huang YJ, Lin YW, Xu RY, et al., 2022, Pathogenesis of Post-Hemiplegic Shoulder Pain and Application Progress of Clinical Rehabilitation Assessment. *Chinese Manipulation & Rehabilitation Medicine*, 13(22): 59–65.
- [3] Xiao YH, 2024, Clinical Observation of Motor Imagery Therapy Combined with Electroacupuncture for Stage I Post-Stroke Shoulder-Hand Syndrome, dissertation, Hunan University of Chinese Medicine.
- [4] Yu CJ, 2020, Efficacy Evaluation of Acupotomy Combined with Acupuncture and Rehabilitation Training in Intervening Stage I Post-Stroke Shoulder-Hand Syndrome, dissertation, Zhejiang Chinese Medical University.
- [5] Zhang MM, Hao N, Li YL, et al., 2022, Wet Compress with Sanggui Shuangzhi Decoction Combined with Wax Therapy for Post-Stroke Shoulder-Hand Syndrome. *Jilin Journal of Traditional Chinese Medicine*, 42(05): 566–569.
- [6] Neurology Branch of Chinese Medical Association, Neurorehabilitation Group of Neurology Branch of Chinese Medical Association, Cerebrovascular Disease Group of Neurology Branch of Chinese Medical Association, 2017, Chinese Guidelines for Early Rehabilitation of Stroke. *Chinese Journal of Neurology*, 50(06): 405–412.
- [7] Cao MJ, Zhang J, 2023, Effects of Extracorporeal Shock Wave Combined with Manual Lymphatic Drainage on Edema Degree and Serum Levels of PGE2, HA and 5-HT in Patients with Stage I Post-Stroke Shoulder-Hand Syndrome. *Journal of Brain and Nervous Diseases*, 31(04): 213–218.
- [8] Zhang F, 2026, Exploration on Rehabilitation Effect of Integrated Traditional Chinese and Western Medicine Therapy in Patients with Post-Stroke Shoulder-Hand Syndrome. *Chinese Full-text Database of Typical Cases*: 1–7.

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