

Efficacy analysis of Zhang's superconducting agreement formula 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion and manual release in the treatment of frozen shoulder of qi stagnation and blood stasis type

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Abstract: Objective: To investigate the effect of Zhang's superconducting prescription 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion and manual release in the treatment of frozen shoulder of qi stagnation and blood stasis type. Methods: A total of 74 patients with frozen shoulder of qi stagnation and blood stasis type admitted to our hospital from January 2024 to December 2024 were selected as the research objects, and they were divided into a control group and a combined group according to the random number table method, with 37 cases in each group. The control group was treated with joint cavity perfusion and manual treatment, and the combined group was treated with Zhang's superconducting protocol 3 ultrasound drug penetration on the basis of the control group. The efficacy, Constant-Murley score, VAS score, American Shoulder and Elbow Surgery score (ASES) and range of motion were compared between the two groups. Results: The effective rate of the combined group was higher than that of the control group ($P < 0.05$). There was no significant difference in Constant-Murley scores between the two groups before treatment ($P > 0.05$). After treatment, the pain, ADL, muscle strength and joint activity scores of the combined group were higher than those of the control group ($P < 0.05$). There were no significant differences in VAS and ASES scores between the two groups before treatment ($P > 0.05$). After treatment, the ASES score of the combined group was higher than that of the control group, and the VAS score was lower than that of the control group ($P < 0.05$). Before treatment, there was no significant difference in joint mobility between the two groups ($P > 0.05$). After treatment, the flexion, extension, abduction, adduction, internal rotation, and external rotation activities of the combined group were higher than those of the control group ($P < 0.05$). Conclusion: Zhang's superconducting agreement Decoction 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion and manual release in the treatment of frozen shoulder of qi stagnation and blood stasis can relieve pain, improve clinical symptoms, improve joint mobility and therapeutic effect of patients.

Keywords: Zhang's superconducting agreement party 3; Ultrasound drug penetration; Shoulder joint cavity perfusion; Release by manipulation; Qi stagnation and blood stasis type; Frozen shoulder

Frozen shoulder, in the past generally known as “frozen shoulder”, also known as “adhesive capsulitis of shoulder”. At present, its pathogenesis has not been clarified. It is characterized by shoulder joint pain and significant limitation of active and passive activities in the absence of known inherent shoulder diseases ^[1]. The incidence of frozen shoulder in the population is 3% to 5%, which is common in people aged 40 to 60, and women are more than men ^[2]. The pathogenesis of frozen shoulder is still unclear. Risk factors include diabetes, hyperthyroidism, and previous cervical spine surgery. Imaging findings are thickening of the joint capsule and shoulder joint space ^[3]. Articular cavity perfusion and manipulation therapy are commonly used in clinical treatment, but the therapeutic effect is still not ideal ^[4]. According to traditional Chinese medicine, frozen shoulder belongs to the category of “arthralgia”. Wind-cold-dampness arthralgia, qi stagnation and blood stasis, and deficiency of qi and blood are the basic syndromes of frozen shoulder. Among them, the common pathogenesis of qi stagnation and blood stasis lies in old age and body aging, loss of muscles and bones in body fluid, overwork and invasion of wind-cold-dampness to damage the shoulder, restricting activities, and pain, its treatment should be Shujin Qi, blood circulation and blood stasis ^[5]. In addition, ultrasonic drug penetration therapy according to ultrasound in the human body can produce warm, physical and chemical, vibration effect, can be directly launched into the diseased tissue in the energy transmission, resulting in a therapeutic effect. It has the advantages of strong targeted treatment and rapid and lasting efficacy ^[6]. Therefore, this study further uses Zhang’s superconducting agreement party 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion and manual loosening to treat qi stagnation and blood stasis type frozen shoulder and observe its therapeutic effect, aiming to provide reference for the further improvement of clinical similar patients.

1.General information and methods

1.1 General Information

74 cases of frozen shoulder with qi stagnation and blood stasis type treated in our hospital from January 2024 to December 2024 were studied. Inclusion criteria ^[7]:(1) Meet the diagnostic criteria of periartthritis of shoulder in Periartthritis of Shoulder, and the disease stage is rigid; The diagnosis of qi stagnation and blood stasis syndrome meets the criteria of Periartthritis of Shoulder;(2) Aged between 30 and 70 years old, gender is not limited; The course of disease is more than 3 months;(3) No previous history of periartthritis of shoulder;(4) The patient fully understands this study, agrees to cooperate to participate, and sign the consent;(5) No drugs and other treatments were given within 4 weeks before entering the group;(6) Abandoning other drugs, acupuncture and rehabilitation training and other interventions during the course of treatment to ensure good compliance. (7) The design and implementation of this study have been approved by the hospital ethics committee. Exclusion criteria:(1) intolerance to the treatment plan used in this study;(2) complicated with serious functional diseases such as lung, liver, kidney and blood system;(3) history of shoulder trauma, or complicated with cervical spondylosis, rotator cuff injury and rheumatic diseases;(4) complicated with malignant tumor;(5) accompanied with neuropsychiatric diseases;(6) patients or their families refused to participate in this study;(6) Patients who were lost to follow-up were also excluded from the study. (7) Those who do not meet the

inclusion criteria. They were divided into control group and combined group by random number table method, 37 cases in each group. The control group was male/female 20/17, aged 31-66 years old, with an average of (50.12 ± 5.45) years old, 19 cases on the left side and 18 cases on the right side. The course of disease was 5-15 weeks, with an average of (10.24 ± 2.31) weeks. The combined group was male/female 18/19, aged 31-68 years old, with an average of (50.31 ± 5.48) years old, there were 16 cases on the left side and 21 cases on the right side, with a course of 5 to 15 weeks, with an average of (10.08 ± 2.29) weeks, and the difference between the two groups of baseline data was not statistically significant ($P = 0.05$). This study was approved by the medical ethics committee of our hospital, and all patients gave informed consent.

1.2 method

The control group was treated with intra-articular perfusion (compound betamethasone needle 1ml + ropivacaine needle 10ml + normal saline into 6.5ml + sodium hyaluronate injection 2.5ml, 20ml in total) and manipulation. The combined group was treated with superconducting protocol 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion (compound betamethasone needle 1ml + ropivacaine needle 10ml + normal saline into 6.5ml + sodium hyaluronate injection 2.5ml, a total of 20ml) and manual release treatment.

The patient with joint cavity perfusion is supine, the affected shoulder is slightly raised, the affected upper limb is slightly abduction and external rotation, after regular disinfection and towel laying, the sterile syringe is vertically pierced into the skin with the gap between the affected shoulder process and the lesser tubercle of humerus as the needle entry point, and the needle tip enters the joint cavity with a sense of breakthrough. The resistance gradually increases, and there is a feeling of swelling in the affected shoulder. Articular cavity perfusion once a week, can be perfused twice, superconducting and manual treatment once every other day, ten times for a course of treatment, a total of a course of treatment.

Manual treatment: refer to the treatment plan of scapulohumeral periarthritis in *Massage Therapy* edited by Fan Binghua, the textbook of the 13th five-year Plan for higher education in the national traditional Chinese medicine industry. (1) The patient takes the sitting position and stands on the affected side, holding up the arm of the affected limb with one hand, operating the front and back of the shoulder with the other hand by kneading or kneading, operating the deltoid muscle with kneading and kneading, and cooperating with the affected shoulder to do outward expansion, forward flexion, backward extension, internal rotation and external rotation movements, which play the role of relaxing tendons, promoting blood circulation, relieving spasm and dredging and dredging collaterals. (2) Following the upward trend, the doctor stood on the affected side and used the one-finger Zen pushing method, pressing method and kneading method to operate at the acupoints of Shoulder Well, Shoulder Zhen and Shoulder Front. The technique should be deep and moderate, with acid swelling as the degree, and play the role of promoting

blood circulation, dredging collaterals and relieving pain. (3) Following the upward trend, the doctor will lift the affected shoulder to the maximum extension and internal rotation amplitude, respectively, in the subscapularis muscle, rhomboid muscle, deltoid muscle, latissimus dorsi muscle, teres major muscle, according to the kneading method, plucking method, manipulation should be deep and gentle, play the role of loosening adhesion, sliding joints. (4) Following the upward trend, the doctor stands on the affected side and carries out the elbow shaking method or the large-scale shoulder shaking method. The range of operation should be from small to large, clockwise and counterclockwise for 5-8 times respectively, which can loosen adhesion and promote functional recovery. (5) Following the upward trend, the doctor stands on the affected side, holding the affected shoulder with both hands to do shoulder rubbing and shoulder joint rubbing, with deep heat as appropriate. Then rub the method from the shoulder joint to the forearm back and forth operation 3~5 times, abduction of about 60 degrees to shake the shoulder method to end the treatment, can play the role of relaxing muscles and activating collaterals.

Ultrasonic drug penetration: preparation drug: superconducting protocol 3 drug composition: cassia twig 5g, chuanwu 5g, mint 5g, asarum 5g, turmeric 8g, angelica 5g, notopterygium 5g, chuanxiong 5g, safflower 5g, vinegar frankincense 3g, borneol 3g, polygonum cuspidatum 15g, xianpi 8g myrrrrrrrk 3g granule boiled water for later. Control group A regular electrode patch, to be used. 2) Tear off the adhesive layer on the patch, place the patch flat on the table top, and stick the ordinary patch on the surface of the permeable cotton after soaking the medicine liquid. The patch is applied to the area where treatment is required. 3) Turn on the power switch of the equipment, press the "start" button to start, and adjust the treatment intensity, mainly to the comfort of the patient, generally to 5-6. 4), treatment for 30 minutes, after the end of treatment, remove the treatment probe, patch indwelling 2-4h.

Both groups were treated for 4 weeks.

1.3 observation indicators

The curative effect of the two groups: the curative effect standard is drawn up with reference to the revised general rules for the standard system of diagnosis and curative effect evaluation of traditional Chinese medicine [8]. cure: shoulder joint pain disappears, no tenderness and normal activity; Effective: shoulder joint pain is relieved, slight tenderness, and activity is improved compared with before; Invalid: symptoms did not improve or even aggravate. Cured, effective means total effective.

Constant-Murley shoulder joint daily life ability rating scale: including pain 15 points, daily life activity level (ADL) 20 points, muscle strength 25 points, joint activity 40 points, full score 100 points, the higher the score, the better the function.

VAS visual analog scale: out of 10 points, the higher the score, the more severe the pain.

The American Association for Shoulder and Elbow Surgery (American Shoulder and Elbow Surgeons, ASES) score, including pain (50%) and cumulative daily activities (50%), has a full score of 100. The higher the score, the better the shoulder function.

Joint range of motion: the use of joint activity meter to detect patients with flexion, extension, abduction, adduction, internal rotation, external rotation mobility.

1.4 statistical methods

In this study, ($\bar{x} \pm s$) is used to represent the measurement data, and t-test is implemented; [n(%)] is used to represent the counting data, and the χ^2 test is implemented, and the rank sum test is used for the grade data. Statistical software 26.0 by SPSS was used for analysis, and when $P < 0.05$, the difference was significant.

Results

Comparison of curative effect of 105.00g groups

The effective rate of the combined group was higher than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. 50.00g Comparison of curative effect of group

Group	Number of cases	Healing	effective	Invalid	efficient
control group	37	12	16	9	28
Joint Group	37	15	20	2	35
Z/ χ^2	-				5.232
P	-				0.022

Comparison of Constant-Murley scores in 110.00g groups

There was no significant difference in the scores of each dimension of the Constant-Murley between the two groups before treatment ($P > 0.05$), but the scores of pain, ADL, muscle strength and joint activity in the combined group after treatment were higher than those in the control group ($P < 0.05$), as shown in

Table 2. 15 20 25 40

Table 2. 100.00g Comparison of Constant-Murley Scores in Groups

Group	Num- ber of cases	Pain		ADL		Muscle strength		joint activity		
		Before treat- ment	After treat- ment	Before treat- ment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment
control group	37	4.25±1.03	6.24±1.12	10.45±1.51 13.01±1.49	17.21±2.14		18.92±2.25	29.45±3.51	33.0	
Joint Group	37	4.32±1.05	7.31±1.20	10.52±1.52 15.39±1.55	17.55±2.16		20.53±2.31	30.04±3.55	35.1	
t	-	0.290	3.965	0.199	6.7330.680		3.037	0.719	2.53	
P	-	0.773	<0.001	0.843	<0.0010.499		0.003	0.475	0.13	

Comparison of VAS and ASES scores in 115.00g groups

d ASES scores between the two groups before treatment was significant (P. 0.05), after treatment, the ASES score and the

VAS score was lower than that of the control group (P 0.05), as shown in Table 3.

Table 3. 150.00g Group VAS, ASES score comparison

Group	Number of cases	VAS		ASES	
		Before treatment	After treatment	Before treatment	After treatment
control group	37	7.25±0.75	4.19±0.43	70.21±6.95	80.14±8.25
Joint Group	37	7.09±0.74	3.51±0.36	71.08±7.03	86.43±8.62
t	-	0.924	7.376	0.535	3.207
P	-	0.359	<0.001	0.594	0.002

Comparison of joint activity in 120.00g groups

The difference in joint activity between the two groups before treatment was significant (P. 0.05), and after treatment, the joint group flexion, extension, abduction, adduction, internal rotation, external rotation activity was higher than that of the control group (P 0.05), see Table 4.

Table 4. 200.00g Comparison of joint activity of groups (°)

Group	Number of cases	forward flexion		PostextensionOutreach		Tone		After treatment	Internal rotation		external rotation
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment		Before treatment	After treatment	
control group	37	80.35±4.25	104.52±7.51	20.18±2.25	24.55±3.11	79.45±6.61	90.37±7.25	25.31±3.02	29.61±3.15	30.53±4.01	37.25±4.14
Joint Group	37	80.53±4.30	112.09±8.03	20.34±2.29	30.12±3.26	80.11±6.68	98.42±8.13	25.19±2.99	33.74±3.20	30.66±4.05	40.12±4.22
t	-	0.181	4.188	0.303	7.520	0.427	4.495	0.172	5.595	0.139	2.953
P	-	0.857	<0.001	0.763	<0.001	0.671	<0.001	0.864	<0.001	0.890	0.004

Discussion

The pathological changes of frozen shoulder core are reflected in the phenomenon of contracture and adhesion of glenohumeral joint capsule, rotator cuff space and coracohumeral ligament, and the volume of joint cavity is reduced [9]. For frozen shoulder caused by chronic rotator cuff injury, some scholars define it as endogenous secondary adhesive capsulitis [10], which is more common in clinical practice. In the conservative treatment of frozen shoulder, non-steroidal anti-inflammatory drugs, corticosteroids, as well as acupuncture therapy, physical therapy, shock wave therapy, etc. are often used. However, in view of the complex characteristics of the lesion site and etiology and pathology, the treatment effect is often difficult to maintain stable. Arthroscopic release, joint cavity expansion, and

joint release under anesthesia can directly relieve the adhesion around the joint, but they cannot effectively alleviate the problems of muscle spasm, muscle atrophy and antagonistic muscle imbalance associated with frozen shoulder ^[11]. In addition, this kind of treatment is an invasive operation, which may cause iatrogenic injury, and the patient's acceptance is low, so the clinical application is limited. This study shows that the use of Zhang's superconducting protocol 3 ultrasonic drug penetration, combined with shoulder joint cavity perfusion and manual release, the treatment of qi stagnation and blood stasis type frozen shoulder, can effectively alleviate the pain of patients, improve clinical symptoms, improve joint activity, enhance the therapeutic effect.

Current studies have pointed out that manual therapy has shown significant effects in multiple dimensions, covering key links such as regulating chronic inflammatory response mechanism pathways, interfering with fibrosis processes, inhibiting nerve fiber dysplasia and neurotransmitter overexpression, reducing acid-sensitive ion channel proteins (ASICs) expression levels, and improving microcirculation disorders ^[12]. The continuous activation of inflammatory response and microcirculation dysfunction are intertwined, and eventually induce the adhesion of the tissues around the shoulder joint, the contracture of the joint capsule and the hyperemia of the synovial membrane. This pathological change further aggravates the inflammatory stimulation, promotes the deterioration of tissue adhesion, and even leads to the change of the position of the ligament tendon attachment point, which seriously damages the biomechanical balance system of the shoulder joint. Its typical clinical manifestations are severe limitation of shoulder joint function, accompanied by severe pain symptoms caused by inflammatory reaction. Manipulative therapy provides an effective solution for the treatment of frozen shoulder through multiple ways to intervene in the pathological mechanism, and its clinical efficacy has been fully verified. However, the mechanism of manual therapy has not been standardized through basic research, and there are different academic views in the relevant literature in recent years. Ling Bo and other scholars ^[13] proposed that the repeated intermittent stimulation of nerve endings by aseptic inflammatory substances is the main cause of pain. Manual therapy can stimulate the mechanoreceptors around the joint tissue, inhibit pain signal conduction, block the nerve conduction pathway, reduce the release of central pain-causing substances, so as to improve the pain threshold and achieve the purpose of relieving frozen shoulder pain. Deng Yingjie and other researchers ^[14-15] used "soft tendons open knot" manipulation to treat frozen shoulder and achieved remarkable curative effect. Its mechanism can be summarized as "soft tendons and qi and blood": by loosening the adhesion and spasm of the tissues around the shoulder, it can promote the recovery of local blood circulation and rebuild the unbalanced biomechanical relationship of shoulder joint. After long-term (more than 4 weeks) manual intervention, effective control of pain symptoms and continuous improvement of joint function can be achieved.

From the perspective of traditional Chinese medicine, frozen shoulder belongs to "arthralgia". "Su Wen, Bi Lun Article" says: "Wind, cold and dampness

are mixed together and form bi. The wind is better than the line arthralgia, the cold is better than the pain arthralgia, and the moisture is better than the arthralgia.” According to the State Administration of Traditional Chinese Medicine “Chinese Medicine Diagnosis and Treatment Criteria”, frozen shoulder syndrome types are divided into three types: wind, cold and dampness, stasis, and qi and blood deficiency. Its etiology and pathogenesis, middle-aged people “yin qi from half, daily life failure”, liver and kidney deficiency, qi and blood deficiency, muscle and vein dystrophia. Or external wind, cold, wet, or strain caused by shoulder injury, so that meridians occlusion, qi and blood stagnation, body fluid disorders, blood does not honor tendons, so “not through pain”, “not glory pain”, shoulder joint movement is limited. Middle-aged and elderly people with deficiency of qi and blood, insufficient liver and kidney, weak resistance to evil, wind, cold, and dampness are easy to invade muscles and joints, obstructing qi and blood; or emotions, diet, spleen and stomach, water dampness, phlegm retention, and obstruction of qi and blood. The cause of frozen shoulder is divided into internal and external causes. Internal causes include liver and kidney deficiency, qi stagnation and blood stasis, endogenous phlegm and dampness, etc. “Su Wen” contains: “Bi lies in the tendons are not stretched.” The liver is the main tendon, the kidney is the main bone, and the liver and kidney deficiency is the tendon and vein cramping, and the activity is unfavorable. External causes include positive and false evil invasion, traumatic strain, etc. Exogenous wind, cold, and dampness are related to old age, deficiency of body yang, and weakness of qi and blood. “Ji Sheng Fang” says: “All are due to physical deficiency, looseness of the body, and arthralgia caused by wind, cold and moisture.” Trauma caused by blood does not follow the meridian, qi and blood is not smooth and pain; Strain caused by muscle muscle and bone strain, “the secret recipe for injury and fracture” contains: “strain of muscle and bone, shoulder and back pain”, indicating that strain can cause frozen shoulder. Based on the theory of collateral disease, patients with frozen shoulder are exposed to wind, cold, dampness, cold and dampness, blocking collaterals and damaging yang qi. Yang qi deficiency, weakness and warmth, causing muscle cramping and pain and joint stiffness. Combined with the pathogenesis of traditional Chinese medicine, this study further combined the use of Zhang’s superconducting protocol 3 through ultrasonic drug penetration for treatment, in which cassia twig sweats and relieves muscles, warms the meridians, helps yang and qi, makes sichuan black and dispels wind and dampness, mint evacuates wind and heat, soothing liver and qi, dispels dampness and pain, turmeric tablets dispels dampness and anti-inflammation, angelica angelica, ligusticum chuanxiong promotes blood circulation and qi, dispels wind and stops pain, safflower promotes blood circulation and meridian circulation, dispels blood stasis and stops pain, vinegar frankincense, borneol, polygonum cuspidatum, rhizome, xianling spleen, myrrh reduces swelling and pain, promotes blood circulation and removes blood stasis, promotes qi and stops pain, improves joint function, reduces pain and improves therapeutic effect, at the same time, it can also

increase the temperature of the local skin and produce thermal effects, promote blood circulation and accelerate drug absorption ^[16].

Conclusion: Zhang's superconducting protocol 3 ultrasonic drug penetration combined with shoulder joint cavity perfusion and manual release in the treatment of qi stagnation and blood stasis type frozen shoulder helps to relieve pain, improve clinical symptoms, improve joint activity and therapeutic effect.

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