

Original Article

Impact of needle warming moxibustion combined with trigger point massage on shoulder function and stress responses in elderly patients with frozen shoulder

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Abstract: Objective: To explore the therapeutic effects of needle warming moxibustion (NWM) combined with trigger point massage on shoulder function and stress responses in elderly patients with frozen shoulder (FS), providing clinical guidance. Methods: A retrospective analysis was conducted on 116 patients with FS treated at the Guangdong Work Injury Rehabilitation Hospital from October 2022 to October 2023. The study included 61 patients who received NWM combined with trigger point massage (research group) and 55 patients who received conventional treatment (control group). Shoulder function and pain were assessed using the Constant-Murley Score (CMS) and the Short-Form McGill Pain Questionnaire (SF-MPQ). Additionally, the time to resume normal daily activities, time to achieve no self-perceived pain, and adverse reactions were documented. Post-treatment stress response indicators and inflammatory factors; adrenaline (ADR), cortisol (Cor), adrenocorticotropic hormone (ACTH), C-reactive protein (CRP), nitric oxide (NO), and prostaglandin E2 (PGE2), were measured. A 3-month follow-up was conducted to record prognostic recurrence. Results: After treatment, the research group showed significantly better shoulder function, reduced pain, and shorter times to resume daily activities and to achieve no self-perceived pain compared to the control group (all $P < 0.05$). Post-treatment levels of ADR, Cor, ACTH, CRP, NO, and PGE2 were also lower in the research group (all $P < 0.05$). The incidence of adverse reactions did not significantly differ between groups ($P > 0.05$); however, the recurrence rate was lower in the research group compared with the control group ($P < 0.05$). Conclusions: NWM combined with trigger point massage effectively improves shoulder function and reduces inflammation and stress responses in elderly patients with FS, supporting its clinical application.

Keywords: Needle warming moxibustion, trigger points, frozen shoulder, massage, stress response

Introduction

Frozen shoulder (FS), also known as adhesive capsulitis, is a common condition characterized by pain and limited mobility of the shoulder joint [1]. It typically has a slow onset and long duration, predominantly affecting middle-aged or elderly women aged 40-50 [1]. FS represents over 50% of all shoulder disorders, with an incidence ranging from 2% to 5% [2]. The prevalence of FS has been increas-

ing in parallel with the global aging population [3].

Current treatments for FS are primarily conservative, including oral anti-inflammatory analgesics, physical therapy, and joint function exercises, aimed at improving or restoring clinical symptoms [4]. However, these treatments often provide only temporary pain relief and may not be suitable for long-term use, especially in elderly patients, due to potential liver and kid-

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ney damage [5]. This necessitates the exploration of safer, more effective, and stable treatment options for FS.

Traditional Chinese medicine (TCM) therapies, such as acupuncture and moxibustion, have gained acceptance among elderly FS patients due to their symptomatic efficacy and fewer adverse reactions [6]. Needle warming moxibustion (NWM), a method that combines acupuncture with moxibustion, enhances the therapeutic effect by addressing the pathogenesis of FS and improving meridian qi and blood flow through thermal action [7]. While NWM is clinically recognized for promoting FS recovery, it has not significantly reduced the risk of recurrence [8].

Recently, TCM trigger point massage, which integrates traditional massage techniques with the concept of trigger points, has gained attention for its ability to improve local blood circulation by accurately targeting pain trigger points [9]. Both NWM and trigger point massage have been validated as effective treatments for FS [10, 11], but their combined effect remains underreported.

This study aims to observe the combined effects of NWM and trigger point massage on shoulder function and stress responses in elderly FS patients, with the goal of confirming its clinical value and providing new insights for future FS treatment strategies.

Materials and methods

Participants

A total of 116 FS patients treated in the orthopedic department of Guangdong Work Injury Rehabilitation Hospital from October 2022 to October 2023 were retrospectively analyzed. The study was approved by the Medical Ethics Committee of Guangdong Work Injury Rehabilitation Hospital. Among these participants, 55 patients who received conventional treatment plus needle warming moxibustion (NWM) comprised the control group, while 61 patients who received additional trigger point massage were assigned to the research group.

Inclusion and exclusion criteria

Inclusion criteria: patients meeting the diagnostic criteria for FS [12]; unilateral FS without

a history of trauma; age over 60 years; no use of other treatment methods during the study period, or discontinuation of previous treatment for more than two weeks; normal communication and cognitive function; and complete clinical data.

Exclusion criteria: patients with hepatic or renal insufficiency; serious cardiovascular, respiratory, hematologic, or other systemic diseases; mental illness; other orthopedic conditions; or those who withdrew for various reasons.

Treatment methods

The control group was treated with Huoxue Zhitong Capsules (Nanjing Zhongshan Pharmacy Co., Ltd.) and routine functional exercises. Additionally, patients were positioned supine, with relaxed shoulders and arms naturally flat. Acupoints around the shoulder were selected, routinely disinfected, and treated with 1.5-inch millipotent needles inserted quickly. After obtaining “qi” through lifting, inserting, twisting, and rotating techniques, 1.5-2.0 cm moxa strips were inserted into the needle handles and ignited. A second cone was ignited after the first one burned out, with a total of two cones used per session. Treatment was administered once daily, with 10 sessions comprising one treatment course. After each course, a 2-day interval was observed before commencing the next course. A total of three treatment courses were completed.

In the research group, trigger point massage was administered in addition to the above treatment. Trigger points, identified based on clinical symptoms and imaging results, were primarily located in the deltoid muscle, the upper and lower borders of the scapular spine, coracoclavicular ligament, subacromial region, scapular spinal margin, and the middle and upper part of the outer edge and inferior angle of the scapula. These points were covered with medical gauze and massaged using techniques such as finger pressing, tapping, pressing, squeezing-pressing, grasping, and palm twisting. The massage force gradually increased from light to heavy, aiming to produce a sensation of deep tissue soreness and swelling. Each trigger point was massaged for about 1 minute, with each session lasting approximately 20 minutes, conducted once daily. The treatment consisted of four consecutive courses of

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Table 1. Comparison of baseline data

Groups	n	Age	Male/female	Duration of disease (months)	Left shoulder/right shoulder
Control group	55	67.4±4.4	20 (36.4)/35 (63.6)	16.2±3.9	29 (52.7)/26 (47.3)
Research group	61	67.0±5.3	24 (39.3)/37 (60.7)	16.4±3.6	35 (57.4)/26 (42.6)
χ^2/t		0.439	0.109	0.287	0.253
P		0.661	0.741	0.775	0.615

5 days each, with a 2-day interval between courses.

Prognostic follow-up

Following the completion of treatment, all patients were followed up for 3 months with regular reexaminations at intervals of no more than 1 month. Prognostic recurrence of FS, defined as the reappearance of any FS-related symptoms, was recorded.

Questionnaire

Shoulder Function Assessment: The Constant-Murley Score (CMS) [13] was used to evaluate shoulder function before and after treatment. Developed by two doctors in Cambridge, UK, the CMS includes four dimensions: shoulder pain (15 points), activities of daily living (20 points), mobility (40 points), and strength (25 points), with a total score ranging from 0 to 100. Higher scores indicate better shoulder function.

Pain Assessment: The patient's pain was assessed using the Short-Form McGill Pain Questionnaire (SF-MPQ) [14], which consisted of Visual Analogue Scale (VAS) and Present Pain Intensity (PPI). Among them, the VAS ranges from 0 to 10, with 0 indicating no pain and 10 indicating unbearable pain. The PPI ranges from 0 to 5, with 0 indicating no pain and 5 indicating unbearable pain. Higher scores reflect more severe pain.

Sample collection and testing

Venous blood samples were collected from both groups in procoagulant tubes and allowed to stand for 30 minutes at room temperature. The samples were then centrifuged at 3000 rpm for 10 minutes to separate the serum, which was analyzed using a Myriad BS-2800M Automatic Biochemistry Analyzer. The serum levels of adrenaline (ADR), cortisol (Cor), adrenocorticotrophic hormone (ACTH), C-reactive

protein (CRP), nitric oxide (NO), and prostaglandin E2 (PGE2) were measured.

Endpoints

The primary endpoints included the comparison of CMS and SF-MPQ scores before and after treatment between the two groups.

Secondary endpoints included the time to resume normal daily activities and the time to no self-perceived pain after treatment. Additionally, ADR, Cor, ACTH, CRP, NO, and PGE2 levels were compared between the groups. The incidence of adverse reactions during treatment and prognostic recurrence were also recorded.

Statistical methods

Data analysis was performed using SPSS 20.0, with a significance level set at $P < 0.05$. Measurement data were expressed as mean \pm standard deviation ($x \pm s$) and analyzed using independent sample t-tests and paired t-tests. Count data were represented as [n (%)] and analyzed using chi-square tests.

Results

Comparison of baseline data

Comparison of baseline data revealed no significant differences between the groups in terms of age, sex, or duration of disease (all $P > 0.05$, **Table 1**), indicating comparability between the two groups.

Comparison of shoulder joint function scores

There were no significant differences in pre-treatment shoulder function scores between the groups (all $P > 0.05$). Post-treatment, both groups showed improvements in pain, activities of daily living, range of motion, and strength, with the research group showing significantly higher scores (all $P < 0.05$, **Figure 1**).

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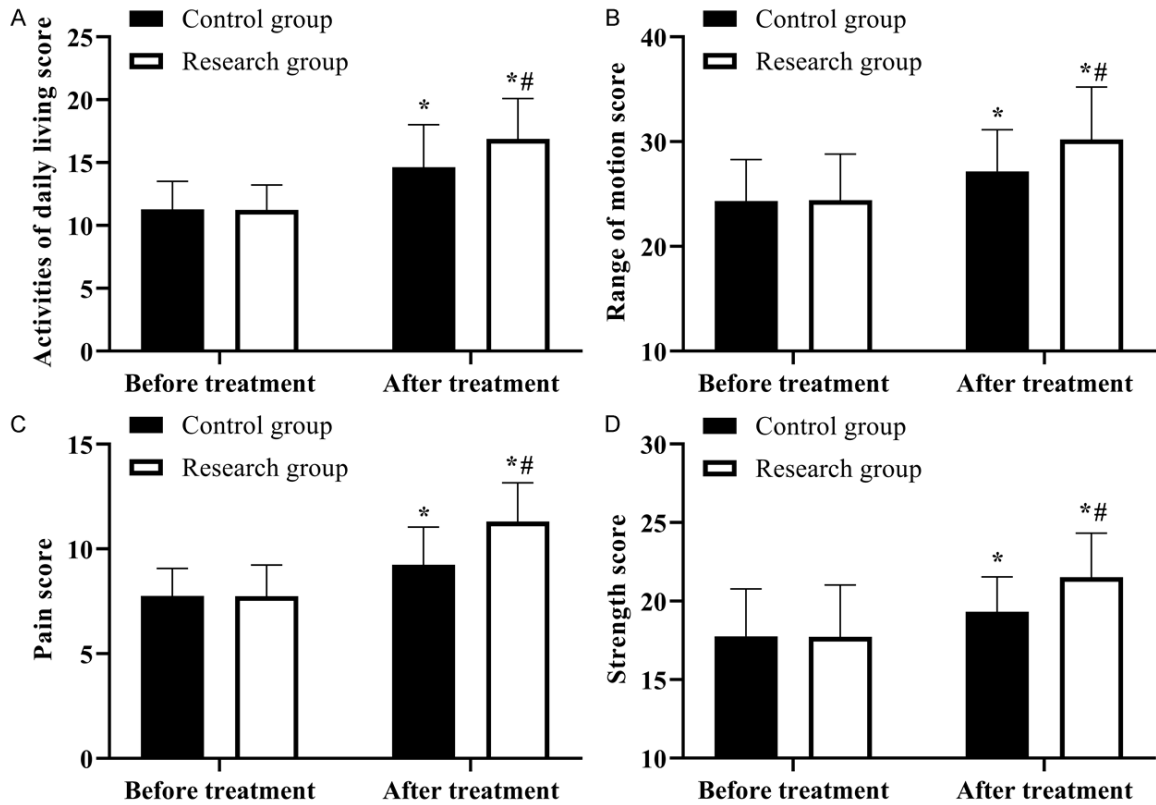


Figure 1. Comparison of shoulder function scores. (A) Activities of daily living, (B) range of motion, (C) pain, (D) strength. vs before treatment * $P < 0.05$, vs Control group # $P < 0.05$.

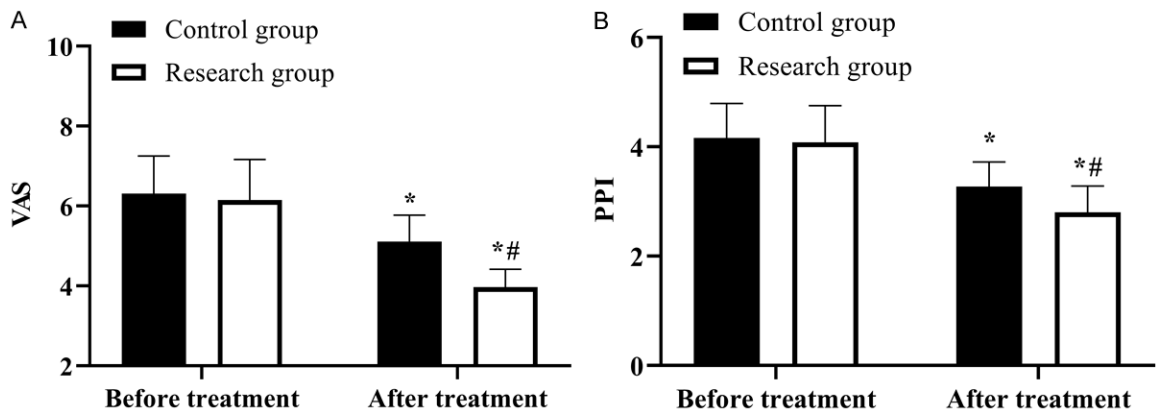


Figure 2. Comparison of pain conditions. (A) VAS, (B) PPI. vs before treatment * $P < 0.05$, vs Control group # $P < 0.05$. VAS, Visual Analogue Scale; PPI, Present Pain Intensity.

Comparison of pain states

Pre-treatment VAS and PPI scores were similar between the groups (both $P > 0.05$). After treatment, both VAS and PPI scores decreased in both groups, with the research group showing significantly lower scores compared to the control group (both $P < 0.05$, **Figure 2**).

Comparison of rehabilitation

The research group resumed normal daily activities and experienced no self-perceived pain after (9.28 ± 1.56) days and (13.39 ± 2.42) days, respectively, both of which were significantly shorter than those in the control group (both $P < 0.05$, **Figure 3**), suggesting bet-

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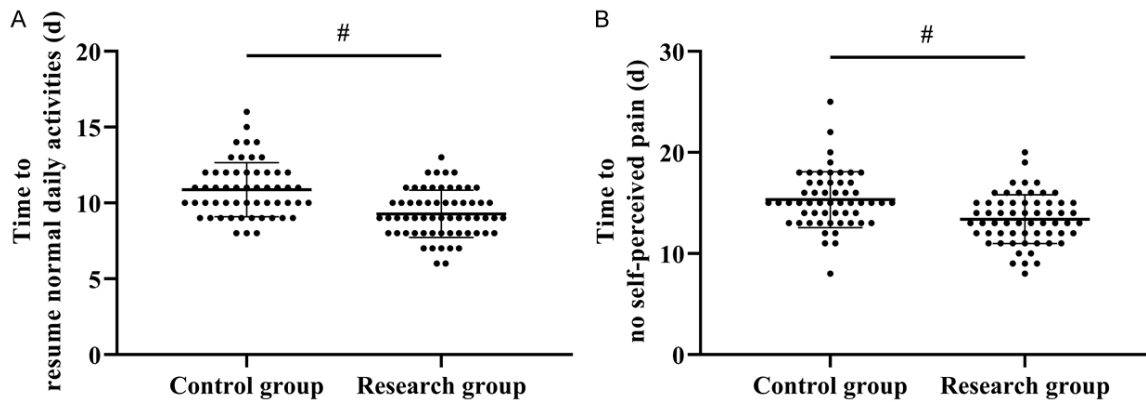


Figure 3. Comparison of rehabilitation. (A) Time to resume normal daily activities, (B) time no self-perceived pain. vs Control group # $P < 0.05$.

ter rehabilitation outcomes in the research group.

Comparison of stress responses

Before treatment, ADR, Cor, and ACTH levels were similar between the groups (all $P > 0.05$). Post-treatment, these indices decreased in both groups, with significantly lower levels in the research group (all $P < 0.05$, **Figure 4**).

Comparison of inflammatory reactions

No significant differences were observed in CRP, NO, and PGE2 levels between the groups before treatment (all $P > 0.05$). Post-treatment, all three inflammatory markers decreased in both groups, with significantly lower levels in the research group (all $P < 0.05$, **Figure 5**), suggesting reduced inflammation in the research group compared to the control group.

Comparison of treatment safety and prognosis

The incidence of adverse reactions in the research group was 8.2%, which was not significantly different from that in the control group ($P > 0.05$). However, the disease recurrence rate in the research group was 30.4% after 3 months, significantly lower than in the control group ($P < 0.05$, **Table 2**).

Discussion

Soft tissue degeneration around the shoulder joint is a major chronic cause of FS in the elderly. Despite the availability of numerous treatment options, FS remains challenging to cure clinically, negatively impacting patients' daily

life, work, and sleep [15]. TCM is widely recognized for its excellent safety profile and stable therapeutic effects in treating various modern clinical diseases [16]. TCM has shown commendable efficacy in treating FS, which is categorized as “shoulder arthralgia” and “shoulder coagulation” in TCM. FS primarily affects middle-aged and elderly individuals over 50, who often experience declining liver and kidney function and qi and blood deficiency, leading to poor blood circulation, malnourished joints and bones, and blood stasis in the shoulder joint [17]. Therefore, the main goal of TCM treatment is to promote qi and blood circulation and dredge the meridians.

This study explored the therapeutic effect of NWM combined with trigger point massage on FS. The results demonstrated significant improvement in shoulder function scores and marked pain reduction in the research group compared to the control group, indicating that NWM combined with trigger point massage is more effective in alleviating FS symptoms. TCM attributes FS to a deficiency of vital qi. According to the treatment principles of “pain is relieved with improved blood circulation”, “tonifying deficiency”, and “treating cold diseases with warm Chinese medicines”, NWM and trigger point massage can reduce joint pain, restore flexibility in the shoulder's soft tissues, and promote rehabilitation. Previous studies have shown that compared to simple acupuncture, NWM can directly deliver the heat from burning moxa to the affected area, dispersing blood stasis, nourishing qi and blood, and providing significant analgesic effects [18]. Additionally, Zhou et al. found that massage

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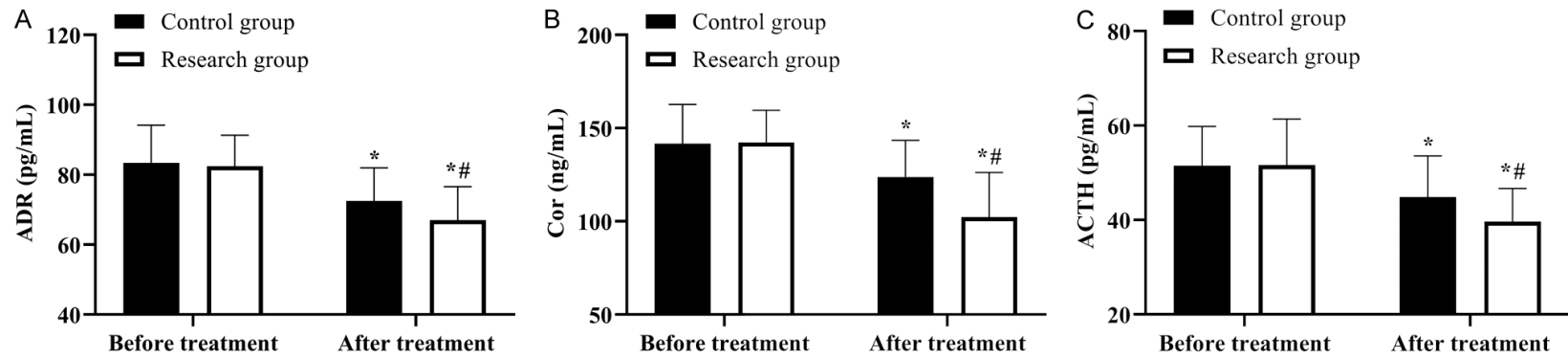


Figure 4. Comparison of stress responses. (A) ADR, (B) Cor, (C) ACTH. vs before treatment *P<0.05, vs Control group #P<0.05. ADR, Adrenaline; Cor, cortisol; ACTH, adrenocorticotrophic hormone.

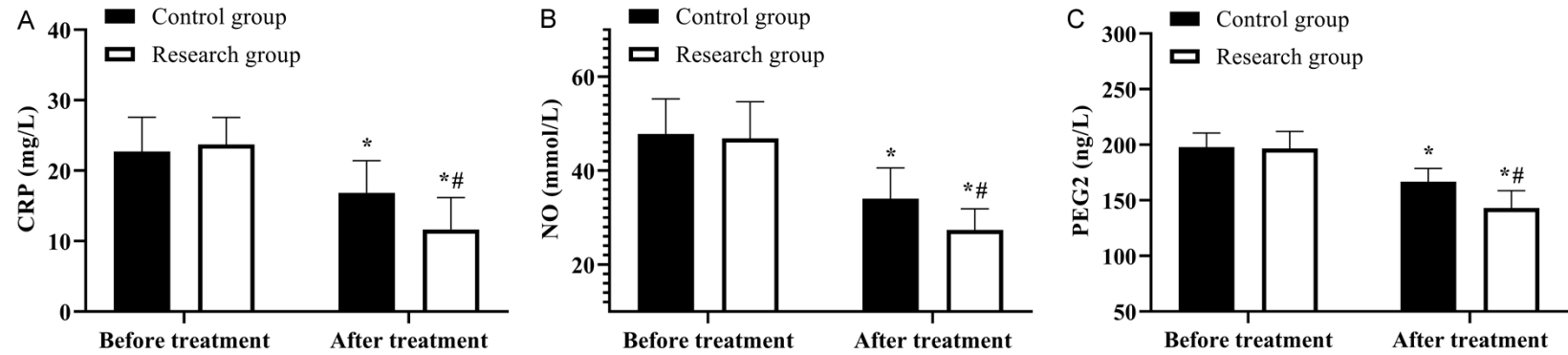


Figure 5. Comparison of inflammatory reactions. (A) CRP, (B) NO, (C) PEG2. vs before treatment *P<0.05, vs Control group #P<0.05. CRP, C-reactive protein; NO, nitric oxide; PGE2, prostaglandin E2.

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Table 2. Comparison of safety and prognosis of treatment

Groups	n	Recurrence	No recurrence	Allergy	Dizziness headache	Regurgitation	Worsening of pain	Total incidence
Control group	55	9 (47.6)	46 (23.8)	2 (3.6)	1 (1.8)	2 (3.6)	1 (1.8)	6 (10.9)
Research group	61	3 (30.4)	58 (7.1)	2 (3.3)	1 (1.6)	2 (3.3)	0 (0.0)	5 (8.2)
χ^2		4.085						0.248
P		0.043						0.619

techniques such as finger pressing, tapping, palm twisting, and grasping, combined with regular shoulder joint movements like abduction and adduction, enhance local blood circulation and muscle contraction, increase the body's absorption of inflammatory factors and metabolites, and effectively relieve muscle spasms, restoring joint function [19]. We hypothesize that this is the main reason for the better shoulder function and greater pain reduction observed in the research group. Similarly, the shorter time for patients in the research group to resume normal daily activities and experience no self-perceived pain further supports the conclusion that NWM combined with trigger point massage is more effective in alleviating FS. These findings are consistent with those of Xu et al. [20], reinforcing our conclusions.

In addition, as a tissue-specific inflammatory reaction, FS is regulated by various immune cells and inflammatory factors [21]. Therefore, addressing the patient's inflammatory and stress responses is crucial for the effective treatment of FS. This study also assessed changes in related biomarkers, finding that ADR, Cor, ACTH, CRP, NO, and PGE2 levels were significantly reduced in both groups after treatment, with more pronounced decreases in the research group. This suggests that NWM combined with trigger point massage more effectively inhibits inflammation and stress responses.

NWM is a therapeutic method that combines acupuncture with moxibustion. During treatment, after needling the acupoints to obtain "qi", a moxibustion stick is inserted into the needle handle, allowing the burning moxa to penetrate the skin at the acupoints. This process warms the meridians, disperses cold, promotes blood circulation, removes stasis, and tonifies qi and blood [22]. Yang et al. found that NWM can enhance local blood circulation,

accelerate the absorption of inflammatory exudates to reduce inflammation, and lower serum levels of inflammatory factors such as IL-6 and TNF- α [23]. These findings support the results observed in this study.

In selecting acupoints, key attachment points of the shoulder soft tissue, essential nodes for maintaining shoulder joint stability, and major points in muscle areas causing pain and mobility disorders were targeted. By stimulating the area around the lesion, this therapy adjusts plasma osmotic pressure, raises the temperature at the lesion site, and stimulates skin receptors. This promotes the diffusion of needle sensation, activates the meridians, accelerates blood circulation in the shoulder, and helps alleviate chronic inflammation [24]. Consequently, patients in the research group exhibited more significant anti-inflammatory and anti-stress responses.

Regarding clinical safety and prognosis, we observed no significant difference in the incidence of adverse reactions between the groups, indicating that NWM combined with trigger point massage is safe. However, the lower recurrence rate in the research group suggests that this combination therapy offers a more stable and long-term prognosis, demonstrating high clinical value for patients with recurrent FS.

Due to the limited number of cases, the results of this study may be somewhat incidental. Additionally, a longer follow-up period is needed to evaluate the long-term prognosis of patients. Finally, analyzing more clinical endpoints is essential to comprehensively assess the therapeutic effect of NWM combined with trigger point massage on FS, providing more robust clinical evidence.

In conclusion, NWM combined with trigger point massage shows significant efficacy in

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improving shoulder joint function, alleviating pain, and activating the body's anti-inflammatory and anti-stress responses. This combination therapy offers a more reliable and stable prognosis for patients, making it a recommended option for clinical use.

Disclosure of conflict of interest

None.

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