Original Article

Effects of heat-sensitive moxibustion combined with naprapathy and warming needle moxibustion combined with naprapathy in patients with periarthritis of shoulder

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Abstract: Objective: To evaluate the effects of heat-sensitive moxibustion (HSM) combined with naprapathy and warming needle moxibustion (WNM) combined with naprapathy on shoulder function and serum levels of calcitonin gene-related peptide (CGRP), substance P (SP), tumor necrosis factor-α (TNF-α) and interleukin-2 (IL-2) in patients with periarthritis of shoulder (POS). Methods: From July 2017 to July 2020, sixty patients with POS admitted to our hospital were selected as the study subjects, and divided into HSM group (n=29) receiving HSM combined with naprapathy and WNM group receiving WNM combined with naprapathy (n=31). The changes in shoulder function, degrees of pain and serum levels of CGRP, SP, TNF-α and IL-2 were compared between the two groups. Results: After treatment, the scores of myodynamia, pain, range of motion (ROM) of shoulder joint and activities of daily living (ADLs) were improved in both groups (P<0.05), and the scores in HSM group were remarkably higher than those in WNM group (P<0.05). Visual analogue scale (VAS) scores after 3 courses of treatment were lower than those after 1 and 2 courses of treatment respectively (P<0.05), and the VAS scores in HSM group were markedly lower than those in WNM group after 1, 2, and 3 courses of treatment (P<0.05). After treatment, the serum levels of CGRP, SP, TNF-α and IL-2 were decreased in both groups (P<0.05), and the levels in HSM group were noticeably lower than those in WNM group (P<0.05). Conclusion: HSM combined with naprapathy is superior to WNM combined with naprapathy in inhibition of inflammatory factors of pain and serum inflammatory factors, alleviating the pain and promoting the restoration of shoulder function in patients with POS.

Keywords: Heat-sensitive moxibustion, warming needle moxibustion, naprapathy, periarthritis of shoulder, shoulder function, inflammatory factor

Introduction

Periarthritis of shoulder (POS) is a common disorder that causes reduced mobility and pain in the shoulder as a result of chronic inflammation of shoulder joint and its peripheral soft tissues induced by degenerative changes and acute and chronic strain in soft tissues around shoulder joint. The shoulder pain progressively worsens, and is obviously worse at night. In addition, protraction of shoulder pain occurs as it progresses, which may lead to dysfunction in daily activities, muscular atrophy, and even self-care incapability [1, 2]. POS is highly prevalent in population aged 40-70 years, and is more common in young population [3].

Clinically, Western medicine treats POS with medication, surgeries and local block. Although the clinical symptoms can be improved, the expected efficacy cannot be achieved because of aggravated pain of patients induced by the long course of disease. Traditional Chinese medicine (TCM) believes that POS, also known as “frozen shoulder” and “omalgia”, belongs to “arthromyodynia”, and is induced by blockage of meridian and unsmooth circulation of Qi and blood as a result of strain, trauma or invasion of wind-cold damp pathogen. Multiple options for treatment of POS are available in TCM. Among them, acupuncture has been extensively implemented, showing a satisfactory efficacy. According to Prescriptions Worth a Thousand in
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Gold, “every disease ... blockage of Qi and blood ... should be treated with acupuncture”. According to Regulation of the Channels, “For regulation of blood and Qi ... temperature will dissipate it”. These suggest the importance of acupuncture in treatment of POS.

Acupuncture can be performed starting from freezing period to expand the range of motion (ROM) of shoulder joint, to relieve adhesion, and to restore joint motion function. Warming needle moxibustion (WNM) combined with naprapathy can transmit the heat generated by moxibustion to the body through the needle body, and give full play to the effects of moxibustion and acupuncture, thus treating POS [4]. Heat-sensitive moxibustion (HSM) is a novel option for the treatment of POS. During the acupuncture treatment, special moxibustion sensations (e.g., diathermancy, heat diffusion and transmission) occur, and the sensory transmission of acupuncture effects is noticeable, so as to achieve the clinical efficacy [5]. However, the comparative studies on the efficacies of HSM combined with naprapathy and WNM combined with naprapathy in the treatment of POS are rarely reported. In view of this, this study compared the effects of HSM combined with naprapathy and WNM combined with naprapathy in the treatment of POS.

Materials and methods

General data

A total of 60 patients with POS admitted to our hospital from July 2017 to July 2020 were selected as the study subjects and divided into HSM group (n=29) and WNM group (n=31) according to the different therapeutic methods. Inclusion criteria: ① patients diagnosed as POS and in line with the diagnostic criteria for POS; ② those with excellent compliance, and ability to cooperate with the acupuncturist. Exclusion criteria: ① shoulder pain induced by traumatic fracture, pyarthrosis, rheumatic arthritis, cervical spondylosis, and acute shoulder dislocation; ② those with cardiovascular and cerebrovascular disease and severe hepatic and renal dysfunction; ③ those with respiratory system diseases, hematological system diseases or malignant tumors; ④ those with allergic physique and acupuncture syncope; ⑤ recently treated with other options; ⑥ halfway withdrawal. This study has been approved by the Ethics Committee of Yichun People’s Hospital. All study participants provided written informed consent before participating in the study.

Methods

HSM group was treated with HSM combined with naprapathy. ① HSM: the scapular region and neck were selected as the heat-sensitive points, and meridian acupoints around the induration site, pressure pain points, and lesion sites were selected as the warming moxibustion center. The warming moxibustion with a diameter of 6 cm was performed for 2 min at a distance of 4 cm from the skin, followed by circling moxibustion for 2 min. Subsequently, birdpecking moxibustion was carried out to enhance the sensitization for 1 min. Next, round-trip meridian moxibustion was performed to stimulate pneuma, and warming moxibustion was conducted to stimulate sensory transmission. The characteristics of heat-sensitive acupoints were that local heat was lower than distant heat, surface heat was lower than the deep heat, and the sensations (numbness, swelling, aching and pain) occurred at the moxibustion (or non-moxibustion) sites. A total of 2 or 3 heat-sensitive acupoints were selected for suspended moxibustion at the specific acupoints. ② Naprapathy: a. Gentle manipulation for relaxation: the patients were required in the sitting position, and the physician gently manipulated the shoulder with the palm for 3-5 times, manipulated the shoulder using the rolling manipulation for 5-10 min, and then kneaded the upper arm and shoulder using multiple fingers for several minutes. b. Plucking and acupressure: the physician stood behind the patient, sought the pain spots through kneading and pushing the muscle groups in the neck and shoulder using the two thumbs, and plucked away the adhesions at the cord-like adhesion using the thumb plucking technique. After a few minutes, acupressure was applied on acupoints (e.g., t’ien tsung, supraclavicular fossa, shoulder well, watching wind, wind pond and upright shoulder). c. Motion of the shoulder joint: the adduction was recommended, and the affected arm was ante-flexed. The patients were told to place their
palms down and put their hands on the contra-
lateral shoulder. The physician held the affect-
ed elbow with one hand, pushed and pressed the
healthy shoulder with the other hand, and
pushed the affected elbow toward the healthy
shoulder. After rotation, the shoulder was
kneaded, the affected arm was extended back-
ward, and the elbow was bent, with the center
of the palm towards the physician. The physi-
cian pulled the shoulder upward while kneading
and pressing the shoulder with one hand, and
pulled the wrist with the other hand. The shoul-
der joint was rotated. The physician held the
elbow joint with one hand, rotated it clockwise
and counterclockwise for 5 times respectively,
with the other hand on the affected shoulder. The
ROM of shoulder joint was increased grad-
ually with patients’ tolerability. d. Patting, pull-
ing and shaking: the physician conducted pat-
ting from the shoulder to anterior wall using an
empty fist or two-handed staff, rubbed and
shook the shoulder several times, and kneaded
the shoulder with multiple fingers.

WNM group was treated with WNM combined
with naprapathy. WNM: the acupoints (e.g.,
shoulder crevice, shoulder blade, Jianqian,
upright shoulder, shoulder well, huge bone, and
medial side of upper arm) were selected as
principal acupoints, and the matching acu-
points (e.g., narrow mouth, yang ming meridi-
ans and connected valleys, zhongping, outer
pass, quchi, tai yang meridian and back stream)
were selected according to the channel and the
sites of pain spots. The acupuncture needle
(0.30 mm × 50 mm) was applied in the princi-
pal and matching acupoints, the needles was
retained for 30 min after the desired sensation
was brought about, and moxa stick (1 cm) was
used at the needle end for moxibustion.

Naprapathy was the same as that in HSM
group.

Three times were a course of treatment, and
the two groups received three courses of
treatment.

Observational indices

① Shoulder function was evaluated by Con-
stant-Murley score [6]. Constant-Murley incl-
udes myodynamia (25 points), pain (15 points),
ROM of shoulder joint (40 points) and activities
of daily living (ADLs) (20 points). A higher score
indicated a better restoration of shoulder function.

② Degree of pain was evaluated by visual ana-
logue scale (VAS) [7]. VAS scoring criteria: 0
point indicates painless and 10 points indicate
the most severe pain.

③ A total of 5 mL of fasting venous blood was
collected at admission (before treatment) and
after three courses of treatment, and centri-
fuged at 3500 rpm/min for 5 min, and the
supernatant blood was taken for testing. The
serum levels of CGRP, SP, TNF-α, and IL-2 were
detected by the enzyme-linked immunosorbent
assay (ELISA).

Statistical method

All data were processed by SPSS22.0. The enu-
meration data were represented by (n, %), and
detected using χ² test. The measurement data
were represented by (x̄ ± s). The comparison
between groups was detected using the inde-
pendent sample t test, and the comparison
within groups was detected using the paired t
test. The comparisons at different time points
were performed using analysis of variance
(ANOVA) of repeatedly measured data, so as to
analyze the differences between groups and
the time differences of values measured at the
time points. Subsequently, the least significant
difference (LSD) t-test was performed. Graph-
pad prism 8 was adopted for statistical charts.
P<0.05 indicated a statistically significant
difference.

Results

Baseline data

HSM group had 29 patients, including 16 males
and 13 females, with a mean age of
(55.54±8.56) years, while WNM group had 31
patients, including 18 males and 13 females,
with a mean age of (54.43±9.66) years. There
was no marked difference in baseline data
[e.g., age, body mass index (BMI), gender,
course of disease, and lesion sites] between
the two groups (P<0.05) (Table 1).

Restoration of shoulder function

Before treatment, there was no remarkable dif-
fERENCE IN SCORES OF MYODYNAMIA, PAIN, ROM OF
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Table 1. Comparison of baseline treatment between the two groups (X ± s; n, %)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of cases</th>
<th>Age (± SD)</th>
<th>BMI (kg/m²) (± SD)</th>
<th>Gender</th>
<th>Course of disease (weeks) (± SD)</th>
<th>Lesion site</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSM group</td>
<td>29</td>
<td>55.54±8.56</td>
<td>22.45±1.04</td>
<td>16 (55.17)</td>
<td>33.26±7.95</td>
<td>15 (44.83)</td>
</tr>
<tr>
<td>WNM group</td>
<td>31</td>
<td>54.43±9.66</td>
<td>22.72±1.54</td>
<td>18 (58.06)</td>
<td>35.62±8.62</td>
<td>14 (45.16)</td>
</tr>
</tbody>
</table>

Table 2. Comparison of Constant-Murley scores between the two groups before and after treatment (X ± s)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Time points</th>
<th>Myodynamia</th>
<th>Pain</th>
<th>ROM of shoulder joint</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSM group (n=29)</td>
<td>Before treatment</td>
<td>15.97±2.35</td>
<td>7.38±2.09</td>
<td>24.61±4.64</td>
<td>12.32±2.45</td>
</tr>
<tr>
<td></td>
<td>After treatment</td>
<td>22.34±1.18</td>
<td>12.32±1.38</td>
<td>35.84±1.62</td>
<td>17.46±1.67</td>
</tr>
<tr>
<td>WNM group (n=31)</td>
<td>Before treatment</td>
<td>15.93±2.39</td>
<td>7.35±2.11</td>
<td>23.89±4.56</td>
<td>12.37±2.49</td>
</tr>
<tr>
<td></td>
<td>After treatment</td>
<td>18.39±2.14</td>
<td>9.46±1.53</td>
<td>30.15±3.65</td>
<td>15.43±2.21</td>
</tr>
</tbody>
</table>

Note: t and P indicate the comparison within groups, t and P indicate the comparison before treatment, and t and P indicate the comparison after treatment.

shoulder joint and ADLs between the two groups (P>0.05). After treatment, the scores of myodynamia, pain, ROM of shoulder joint and ADLs were elevated in both groups (P<0.05), and the scores in HSM group [22.34±1.18], (12.32±1.38), (35.84±1.62), and (17.46±1.67) were noticeably higher than those in WNM group [(18.39±2.14), (9.46±1.53), (30.15±3.65), and (15.43±2.21)] (P<0.05) (Table 2).

Degrees of pain

The repeated measurements showed that there were marked differences in VAS scores between groups at different time points, and the interactions of time points and between groups were significantly different (P<0.05). The LSD-t test suggested that there were significant differences in VAS scores between the two groups before treatment (P>0.05). The comparison of VAS scores between groups revealed that VAS scores after 3 courses of treatment were lower than those after 2 courses of treatment and those after 1 course of treatment (P<0.05), and the VAS scores in HSM group were notably lower than those in WNM group after 1, 2, and 3 courses of treatment (P<0.05) (Table 3 and Figure 1).

The serum levels of CGRP, SP, TNF-α and IL-2

There was no significant difference in the serum levels of CGRP, SP, TNF-α, and IL-2 between the two groups before treatment (P>0.05). After treatment, the serum levels of CGRP, SP, TNF-α and IL-2 were reduced in the two groups (P<0.05), and the levels in HSM group [(78.68±10.49) ng/L, (68.42±8.33) ng/mL, (26.11±5.67) pg/mL, and (107.52±15.65) pg/mL] were noticeably lower than those in WNM group [(137.61±18.95) ng/L, (159.85±13.58) ng/mL, (32.62±6.68) pg/mL, and (155.43±22.17) pg/mL] (P<0.05) (Table 4, Figures 2-5).

Discussion

According to TCM, the occurrence of POS is due to insufficient nourishment of blood and...
Heat-sensitive moxibustion and naprapathy vs. warming needle moxibustion and naprapathy

Qi-stagnancy and blood stasis in tendon and vessel induced by meridians invaded by wind cold caused by exogenous pathogenic factor in the shoulder. Therefore, it is necessary to dredge the meridians, activate blood circulation, and dispel cold and remove dampness. Acupuncture can stimulate meridians to improve local blood circulation, thus promoting Qi to activate blood and dredge meridians and collaterals. Naprapathy is a TCM option used to treat diseases by clicking, pinching, kneading, patting, pushing, and pressing, and can dredge meridians, promote the circulation of Qi and blood, regulate Yin and Yang, heal the wounded and relieve pain, and eliminate pathogen to support vital qi [8]. WNM can transfer the heat generated by moxa stick and moxibustion through the needle body to muscle for exudation, and has the function of warming Yang and dispelling cold, dispersing blood stasis and dredging collaterals, thus strengthening blood circulation, promoting tissue metabolism and alleviate patients’ pain [9, 10]. HSM can promote the conduction and circulation of meridian Qi through stimulating the sensory transmission of meridian Qi, so that sensitized acupoints can have “a big response” to a small exogenous stimulus, thereby warming meridians and dispelling cold, dispersing blood stasis and eliminating stagnation, and tonifying healthy Qi. This study compared the efficacies of HSM combined with naprapathy and WNM combined with naprapathy in the treatment of POS, and the results suggested that HSM combined with naprapathy demonstrated a more satisfactory efficacy [11].

In this study, the scores of myodynamia, pain, ROM of shoulder joint and ADLs were improved in the two groups after treatment, and the aforementioned scores in HSM group were remarkably higher than those in WNM group, suggesting that HSM combined with naprapathy was superior to WNM combined with naprapathy in improving shoulder function. This can be attributed to the reason that HSM can induce six special moxibustion sensations: a. diathermancy, namely, patients can feel a continuous stream of heat flow penetrating into the body and reaching the internal organs; b. heat transmission, namely, patients can feel that heat is primarily transmitted along the meridians to other places at the moxibustion site; c. heat diffusion, namely, patients feels that the heat is diffused around the moxibustion site; d. patients do not feel local heat at the moxibustion site, but feel heat at the distant site; e. patients do not feel heat on the skin surface at the moxibustion site, but feel heat at the deep site; f. patients have sensations (e.g., numbness, swelling, and aching). During the HSM, patients have the aforementioned moxibustion sensations (i.e., heat sensitivity), which can

### Table 3. Comparison of VAS scores between the two groups at different time points (X ± s)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of cases</th>
<th>Before treatment</th>
<th>1 course of treatment</th>
<th>2 courses of treatment</th>
<th>3 courses of treatment</th>
<th>F time points</th>
<th>F between groups</th>
<th>F interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSM group</td>
<td>29</td>
<td>6.45±0.74</td>
<td>3.21±0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.55±0.51&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>0.93±0.26&lt;sup&gt;a,b,c&lt;/sup&gt;</td>
<td>1002.7413</td>
<td>186.851</td>
<td>108.331</td>
</tr>
<tr>
<td>WNM group</td>
<td>31</td>
<td>6.45±0.81</td>
<td>5.65±0.71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.23±0.56&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>2.23±0.43&lt;sup&gt;a,b,c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: compared with before treatment, <sup>a</sup>P<0.05; compared with one course of treatment, <sup>b</sup>P<0.05; compared with two courses of treatment, <sup>c</sup>P<0.05.

**Figure 1.** Comparison of VAS scores between the two groups at different time points. There was no remarkable difference in VAS scores between the two groups before treatment (P>0.05). The VAS scores in HSM group were notably lower than those in WNM group after 1, 2, and 3 courses of treatment (P<0.05). ‘indicates the comparison between the two groups at the same time points (P<0.05).
Heat-sensitive moxibustion and naprapathy vs. warming needle moxibustion and naprapathy

Studies suggest that patients with POS experience abnormal local inflammatory responses and an unbalanced expression of inflammatory factors [12, 13]. CGRP, an endogenous vasodilator material, has the strongest effect and is related to pain reaction [14]. A study reveals that healthy people have a low content of CGRP, the release of a large amount of CGRP leads to the transmission of pain information, and CGRP is related to neuropathologic pain [15]. In addition, CGRP can promote the release of SP and enhance the activity of SP, while SP can induce and transmit pain, and the release of SP is closely related to local neurogenic inflammation [16, 17]. TNF-α, secreted by monocytes, can aggravate local inflammatory reactions [18]. IL-2, a pro-inflammatory T cell mainly generated in Th1 cells, can enhance the immune response of cells and activate macrophages. Studies demonstrate that IL-2 is related to inflammation [19, 20]. In this study, the serum levels of CGRP, SP, TNF-α, and IL-2 were decreased in the two groups after treatment, and the aforementioned levels in HSM group were noticeably lower than those in WNM group.

### Table 4. Comparison of the serum levels of CGRP, SP, TNF-α and IL-2 between the two groups before and after treatment (X ± s)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Time points</th>
<th>CGRP (ng/L)</th>
<th>SP (ng/mL)</th>
<th>TNF-α (pg/mL)</th>
<th>IL-2 (pg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSM group</td>
<td>Before treatment</td>
<td>285.47±23.23</td>
<td>312.61±20.38</td>
<td>42.51±8.02</td>
<td>641.36±144.43</td>
</tr>
<tr>
<td></td>
<td>After treatment</td>
<td>78.68±10.49</td>
<td>68.42±8.83</td>
<td>26.11±5.67</td>
<td>107.52±15.65</td>
</tr>
<tr>
<td>t_a value</td>
<td></td>
<td>43.69</td>
<td>59.206</td>
<td>8.992</td>
<td>19.789</td>
</tr>
<tr>
<td>P_a value</td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>WNM group</td>
<td>Before treatment</td>
<td>284.32±23.11</td>
<td>313.41±20.09</td>
<td>43.21±7.96</td>
<td>642.31±140.43</td>
</tr>
<tr>
<td></td>
<td>After treatment</td>
<td>137.61±18.95</td>
<td>159.85±13.58</td>
<td>32.62±6.68</td>
<td>155.43±22.17</td>
</tr>
<tr>
<td>t_a value</td>
<td></td>
<td>27.332</td>
<td>35.258</td>
<td>5.674</td>
<td>19.068</td>
</tr>
<tr>
<td>P_a value</td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note: compared with before treatment, *P<0.05; compared with one course of treatment, *P<0.05; compared with two courses of treatment, *P<0.05.

![Figure 2](image1.png)

**Figure 2.** Comparison of CGRP levels between the two groups before and after treatment. There was no marked difference in the CGRP levels between the two groups before treatment (P>0.05), and the CGRP levels in HSM group were notably lower than those in WNM group after treatment (P<0.05). *indicates the comparison between the two groups (P<0.05).

![Figure 3](image2.png)

**Figure 3.** Comparison of SP levels between the two groups before and after treatment. There was no noticeable difference in the SP levels between the two groups before treatment (P>0.05), and the SP levels in HSM group were significantly lower than those in WNM group after treatment (P<0.05). *indicates the comparison between the two groups (P<0.05).
group. The results exhibited that HSM combined with naprapathy was superior to WNM combined with naprapathy in improving inflammatory factors of pain and serum inflammatory factors. The VAS scores were decreased with time in the two groups, and the VAS scores in HSM group were significantly lower than those in WNM group after different courses of treatment. Moreover, HSM combined with naprapathy could more effectively alleviate the pain of patients with POS through inhibition inflammatory factors of pain.

In summary, HSM combined with naprapathy is superior to WNM combined with naprapathy in improving the serum levels of CGRP, SP, TNF-α, and IL-2, inhibiting inflammatory factors of pain and serum inflammatory factors, alleviating the pain, and promoting the restoration of shoulder function in patients with POS. However, due to the small sample size, the observation duration of only three courses of treatment, and the short-term follow-ups, no long-term efficacy was obtained. Therefore, the future studies with a larger sample size and a longer duration for follow-ups should be performed, so as to further investigate the long-term efficacy.

Disclosure of conflict of interest

None.

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References

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