Comparative effect of Gong’s mobilization and Spencer technique to manage Frozen Shoulder

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Abstract

Introduction. Physical therapy plays a significant role in managing frozen shoulder (FS), and it includes applying manual mobilization techniques to reduce pain, restore the extensibility of the shoulder capsule and increase range of motion (ROM). Objective: To compare the effectiveness of Gong's mobilization (GM) and Spencer technique (ST) in reducing pain, functional disability, and improving shoulder ROM on FS patients.

Methods. A pre-and-post-test experimental study design was adopted, where thirty patients (n = 30) diagnosed with unilateral FS were selected and randomized into two groups of 15 using a simple random technique. Subjects in experimental group 1 (EG-I) received ST technique and ultrasound therapy (US), with Codman’s pendular exercise (CPE). Whereas experimental group II (EG-II) received GM technique and US, with CPE. The intervention lasted five days and consisted of one session every day. Three variables were assessed to study the treatment effectiveness both at the pre-intervention and at the end of the first week: (i) pain intensity as measured by the Visual Analogue Scale; (ii) shoulder ROM as measured by a goniometer (abduction, flexion, and medial rotation (MR)); and (iii) functional disability as measured by SPADI (Shoulder Pain Disability Index).

Results. The EG-II showed a better reduction in pain intensity (mean difference (MD) of 0.87), SPADI (MD of 7), and increase in shoulder ROM (MD: ‘abduction’: 15.76; ‘Flexion’: 15.67; ‘MR’: 10.33) than the EG-I at 0.05 levels of significance.

Conclusions. Gong’s mobilization was found to be more effective than Spencer's technique with ultrasound therapy and CPE in treating patients with FS.

Key words: frozen shoulder, adhesive capsulitis, Gong’s mobilization, Spencer technique, ultrasound therapy, shoulder exercises

Introduction

Frozen shoulder (FS), also known as adhesive capsulitis (AC), is a soft tissue disorder that causes pain, stiffness, and a progressive loss of active or passive range of motion in the glenohumeral joint [1]. The shoulder joint capsule, which is inflamed, thick, and stiff connective tissue that surrounds the shoulder joint [2]. The condition is known as a “frozen” shoulder because the more painful the shoulder becomes, the less likely it will be used [3]. The shoulder capsule thickens and tightens as a result of lack of use, making the shoulder even more difficult to move – it is frozen in position [4, 5]. The prevalence of frozen shoulder is 2% in the general population, where 10%–29% of those with diabetes are prone to this problem [6]. FS affects significantly more women than males, and it occurs more frequently in the non-dominant arm [1]. This condition mostly affects adults between the ages of 40 and 60, and it only rarely affects those under the age of 40. About 12% of those affected get symptoms on both sides, indicating a genetic tendency [1].

A frozen shoulder begins with a painful “freezing” phase, during which discomfort gradually intensifies and shoulder motion becomes more difficult. The pain is usually worst at night. This stage might last anywhere between 6 and 9 months. The second stage, the “frozen” stage, sees no worsening of the pain and may even improve it; nonetheless, the shoulder stays stiff for 4 to 6 months, and movement may be limited. Finally, the third stage, known as “ thawing,” might take anywhere from six months to two years. Movements become easier and gradually return to normal during this phase; pain may fade but may reappear on occasion [7].

The disease is thought to be a combination of chronic inflammation and capsular fibrosis [8]. Pain in the shoulder that disrupts sleep usually prompts patients to seek medical help. Several treatment approaches for
Frozen shoulder have been published in the literature, including oral medicine, corticosteroid injections, exercises, joint mobilization, acupuncture, manipulation, nerve blocks, and surgery [4, 9]. In addition, physiotherapy interventions such as thermal therapy, therapeutic modalities such as interferential therapy, ultrasound therapy, therapeutic exercises, stretching, graded mobilization, and manipulative techniques such as high thrust velocity, low amplitude, end-range-mid-range mobilization, Spencer’s technique with muscle energy technique, and mobilization with movement in the shoulder, are used to treat adhesive capsulitis [10]. Among these techniques, intensive mobilization techniques play a significant role in managing the FS [11]. An earlier study found that Gong’s mobilization is a valuable treatment option in the clinical context since it immediately improves the range of motion [12–16]. Gong’s mobilization technique is also known as end-range mobilization. With the shoulder in the dynamic posture, a corrected Antero-Posterior glide is administered, followed by distraction and performing the restricted movement. Then, with persistent stretching, oscillation at Maitland’s grades 3 and 4 is applied. As a result, it incorporates both distractions and Maitland’s approach [17]. Furthermore, Gong’s mobilization approach improves shoulder medial rotation more effectively than anterior to posterior gliding, and it is a type of end-range mobilization that keeps the shoulder in a neutral position [18].

Spencer’s technique is a standardized sequence of shoulder treatments that can be used for diagnosis, treatment, and prognosis [19]. This is a common osteopathic manipulative treatment that focuses on glenohumeral and scapulothoracic joint mobilization. It aids in the improvement of restricted joints’ function while also having a good impact on other emotional, social, and cognitive domains. Spencer’s technique is a seven-procedure articulatory approach for treating shoulder limitation caused by FS. Contracted muscles, ligaments, and capsules are stretched using a passive, smooth, rhythmic motion. The majority of the force is applied at the very end range of motion. Stretching the tissues, increasing lymphatic flow, and generating greater joint circulation are all part of this approach [1]. Apart from these manipulative techniques, there is strong evidence that ultrasound can be used as a therapeutic modality in the treatment of frozen shoulders [20, 21]. The possible thermal effect, promoting tissue relaxation, local blood flow facilitation, and breaking down the scar tissue achieved through ultrasound therapy, makes physiotherapy a beneficial treatment mode [22, 23].

Despite the fact that studies have shown that Gong’s mobilization and Spencer’s technique are both beneficial in treating frozen shoulder, it would be fascinating to see which is more effective. As a result, the purpose of this study is to assess the efficacy of Gong’s mobilization and Spencer’s technique when combined with ultrasound therapy and shoulder exercises. Specifically, the authors conducted this research to study the effectiveness of (i) Gong’s mobilization in reducing pain and functional disability and improving ROM in patients with frozen shoulder; (ii) Spencer technique combined with ultrasound therapy in reducing pain and improving range of motion in patients with frozen shoulder; and (iii) comparing the effectiveness of Gong’s mobilization and Spencer technique in reducing pain and improving range of motion in patients with frozen shoulder.

**Subjects and methods**

**Study design**

The effectiveness of Gong’s mobilization and Spencer technique on frozen shoulder patients was evaluated using a pre-test, the post-test experimental study design with two different intervention groups.

**Subjects**

All those patients complaining of shoulder pain visiting the Physiotherapy department, Co-Operative Institute of Health Science, Thalasseri, Kerala state, formed the population for this study, and ethical approval was obtained for the conduct of this study (IRB No. 06/2018/MPT/Musculoskeletal & Sports/CIHS). Among them, those patients (n = 33) diagnosed with unilateral frozen shoulder were invited to participate in this study. Upon invitation, the physician examined all the subjects to exclude structural bony abnormalities and degenerative disorders around the upper extremity. The following criteria were used to screen subjects with unilateral frozen shoulders and include them in the sampling frame: (i) both genders aged between 50 and 60; (ii) unilateral frozen shoulder with pain lasting more than one month; (iii) capsular pattern of motion restriction; and (iv) with more than 50% loss of passive movement of the shoulder joint compared to the unaffected side. Frozen shoulder as a result of trauma, reflex sympathetic dystrophy, rotator cuff tear, dislocation of the shoulder, recurrent dislocation, shoulder subluxation, upper limb fracture, and any history of shoulder surgery on the affected shoulder are all excluded. Based on the application of both inclusive and exclusive criteria, three patients were excluded making the total of 30 samples, and they have participated in this study. The total duration of this study was conducted for six months.

**Randomization**

The subjects were assigned to two groups using a simple random sampling approach. As such, each subject was asked to draw an envelope from a concealed box; each envelope contained a red or blue card,
and based on the selection, subjects were assigned to one of the two groups of the study. The person who handled the concealed box was not involved in the study. Therefore, the subjects who picked red cards were assigned to group 1, and those who picked blue cards were assigned to group II, as depicted in Figure 1.

Unilateral frozen shoulder Patients chosen for Eligibility 
(n=33) 
Excluded (n=3), not meeting the inclusive Criteria 
Randomized (N=30) 
Allocation 
Group-1 (Spencer's mobilization technique Group) 
[n=15] 
Group-2 (Gong's mobilization technique Group) 
[n=15] 
No Drop-outs 
Analysis (Pre-Post 1 week) 
Subjected to Analysis 
(n=15) 
Subjected to Analysis 
(n=15)

Figure 1. Flow Chart showing randomization of Subjects

Methods

A pilot study was conducted to estimate the sample size per group using the formula proposed in a previous study by Sakpal [24]. The mean change in VAS scores following Spencer's technique and Gong's mobilization technique was calculated. Subsequently, it is observed that 13 subjects in each group are adequate to detect a clinically important difference between groups in decreasing pain with an assumed standard deviation of 0.60, 80% power, and 5% level of significance. Anticipating a 10% of dropout rate, this study fixed the sample size per group as 15. Before being subjected to the chosen treatment procedures, all of the subjects were randomized into two groups of 15 using a simple random technique. All of the subjects (n = 30) were identified at the pre-treatment level in terms of the outcome parameters, as evidenced by the p-value (p > 0.05) (Table 1). Subjects in experimental group-1 received ultrasound therapy as well as Spencer's mobilization technique, whereas those in experimental group II received ultrasound therapy as well as Gong's mobilization technique. Both groups were provided a common set of home instructions, which they were encouraged to follow throughout the study period. During the trial, no drugs were administered. The intervention lasted five days and consisted of one session every day, excluding weekends (i.e., 5 sessions per week). Three variables were used to assess the treatment technique's effectiveness: (i) pain intensity as measured by the Visual Analogue Scale (VAS); (ii) shoulder range of motion as measured by a goniometer (shoulder abduction, flexion, and medial rotation); and (iii) functional disability as measured by SPADI (Shoulder pain disability index). The Visual Analog Scale [25], Manual goniometer [26], and SPADI are all reliable and valid techniques, as evidenced by previous studies [27]. On the first day (Day 1) and at the end of the first week (Day 5), VAS, goniometer, and SPADI were used to assess all 30 patients.

Methods

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Description of experimental interventions

Gong’s mobilization technique

The Gong mobilization approach used in this study is based on Gong et al. instructions [12]. The subject was placed in a side-lying position with the affected shoulder joint facing upward. The subject’s shoulder was abducted at 90 degrees to maintain the humerus’ vertical position and the flexed elbow joint in a 90-degree position. The therapist used one hand to keep the subject's elbow joint at 90 degrees, his elbow below the subject's elbow joint, and the other hand to press the humerus head from anterior to posterior. The therapist next elevated the therapist's own body while slightly pulling on the articular capsule of the shoulder joint, keeping the vertical axis of the humerus constant by maintaining shoulder abduction and elbow at 90 degrees. This gentle pushing of the articular capsule was sustained for 10–15 seconds before relaxing for 5 seconds; the whole manoeuvre lasted roughly 2–3 minutes. The therapist used one hand to press the shoulder joint from anterior to posterior after slightly extending the articular capsule. This prevented vertical pulling of the slightly extended articular capsule and the humerus. The therapist used the other hand to hold the elbow while performing shoulder medial rotation. Then, to enhance ROM, oscillation at Maitland's grades 3 and 4 was performed, followed by 7 seconds of prolonged stretching at the grade 4 technique.

Spencer’s technique

Spencer’s technique adopted in this study is based on the guidelines provided by Nicholas [28] and Knebl [29]. The patient was resting on his side, with the affected shoulder raised above him. In seven separate movements, the therapist used the proximal hand to stabilize the shoulder girdle while the distal hand-applied force to the restrictive barrier of the shoulder. Shoulder extension (SE), circumduction with compression, shoulder flexion (SF), circumduction with distraction, abduction, adduction with internal rotation, and glenohumeral pump were the exercises performed. Patients were advised to employ their muscle energy technique against the small resistance given by the therapist for 3–5 seconds throughout each movement. Over the course of five days, the exercise was repeated 3–5 times per session with rest breaks.

Ultrasound therapy

During the intervention period, all patients had five sessions of pulsed ultrasound therapy around the shoulder joint, each lasting 8 minutes with 1 minute on and 1 minute off at a frequency of 3 MHz and an intensity of 1.5 W/cm².

Home-based exercise program

In addition to the therapeutic intervention described above, all individuals in both experimental groups were given a common set of Codman’s pendular exercises to do at home five times daily in 5-to-10-minute sessions viz. (1) bend at the waist so the affected arm is dangling down. The patient is allowed to hold onto a table or chair for support. Gently rock body weight from left to right foot or in a circular motion to move the affected arm in a circular pattern and reverse the arm’s movement in the opposite direction. Patients are instructed to do this five times in each direction. (2) bend at the waist so the affected arm is dangling down. The patient is allowed to hold onto a table or chair for support. Move the affected arm forward and backward and swing freely. Do this five times in each direction. (3) bend at the waist so that the affected arm is dangling down. The patient is allowed to hold onto a table or chair for support. Move the affected arms side to side and swing them freely. Patients are instructed to do this five times in each direction.

Statistical analysis

Data were analyzed using SPSS (Statistical Package for Social Sciences) for Windows, version 21.0. The paired ‘t’-test was employed to see if there was a significant difference between pre- and post-treatment scores in each group separately. In addition, an unpaired ‘t’-test was used to assess the effectiveness of treatment between the two intervention groups on three outcome measures. Besides, the effect size (r) (Cohen’s d) was calculated to find out the magnitude of change in the mean score of an outcome measure from one-time point to another [30, 31]. Also, the standard deviation (SD) approach, which is a distribution-based method [32] used to calculate the minimum clinically important difference (MCID) in pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation ROM following both Gong’s mobilization and Spencer’s technique.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Institutional Ethics Committee of Co-operative Institute of Health Sciences (decision number: IRB No. 06/2018/MPT/Musculoskeletal & Sports/CIHS).
Informed consent
Informed consent has been obtained from all individuals included in this study.

Results

This study observed no dropouts of subjects, and there were no adverse events reported during the treatment duration. The data of all the participants (n = 30) were subjected to statistical treatment at 0.05 levels of significance. From the analysis, it is inferred that there is no significant difference in the mean scores of all dependent variables prior to the application of the selected therapeutic interventions at the Pre-intervention stage, as revealed through an unpaired t-test at 0.05 levels of significance. Furthermore, no clinically significant difference was observed in the pre-intervention mean of pain and SPADI with a small effect size. Similarly, there was no clinically significant difference in the pre-intervention mean scores of flexion, abduction, and external rotation with medium effect size (Table 1).

Table 1. Analysis of Pain, ROM, self-rated upper-extremity disability of subjects in Gong’s Mobilization and Spencer’s Technique group (Pre-test analysis)

<table>
<thead>
<tr>
<th>Outcome parameter</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>95% Confidence interval of the difference</th>
<th>Effect size (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain intensity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experiential group-I</td>
<td>7.73</td>
<td>0.88</td>
<td>0.22</td>
<td>(p = 0.831) **</td>
<td>0.164 (Small)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>7.87</td>
<td>0.83</td>
<td></td>
<td>(p = 0.831) **</td>
<td></td>
</tr>
<tr>
<td>Abduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experiential group-I</td>
<td>60.0</td>
<td>22.68</td>
<td>0.17</td>
<td>(p = 0.831) **</td>
<td>0.414 (Medium)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>68.33</td>
<td>17.18</td>
<td></td>
<td>(p = 0.831) **</td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experiential group-I</td>
<td>84.0</td>
<td>17.03</td>
<td>0.73</td>
<td>(p = 0.831) **</td>
<td>0.579 (Medium)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>94.33</td>
<td>18.59</td>
<td></td>
<td>(p = 0.831) **</td>
<td></td>
</tr>
<tr>
<td>Medical rotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experiential group-I</td>
<td>28.33</td>
<td>14.09</td>
<td>0.07</td>
<td>(p = 0.831) **</td>
<td>0.467 (Medium)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>34.67</td>
<td>13.02</td>
<td></td>
<td>(p = 0.831) **</td>
<td></td>
</tr>
<tr>
<td>SPADI (shoulder pain disability index)</td>
<td>Experiential group-I</td>
<td>79.0</td>
<td>12.70</td>
<td>0.00</td>
<td>(p = 1.00) **</td>
<td>0.000 (Small)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>79.0</td>
<td>14.17</td>
<td></td>
<td>(p = 1.00) **</td>
<td></td>
</tr>
</tbody>
</table>

** non-significant at 0.05 levels (p > 0.05)

In both experimental groups, a further attempt was made to study whether any significant difference was found in the dependent variables between the two specific time periods (i.e., pre-treatment phase and at the end of the first week). While comparing the outcome parameters between the pre-intervention phase and the end of the first week of the intervention period, there was a significant reduction in pain intensity, improvement in shoulder range of motion, and reduction in SPADI in both experimental groups at 0.05 levels of significance, as shown in table 2. Also, it is observed that there is a clinically significant reduction in pain and disability and improvement of shoulder ROM with a large effect size in both experimental groups following their respective treatment intervention.

Table 2. Analysis of Pain, ROM, self-rated upper-extremity disability of subjects in Gong’s Mobilization and Spencer’s Technique group (Pre-test versus Post-test analysis)

<table>
<thead>
<tr>
<th>Outcome Parameter</th>
<th>Groups</th>
<th>Pre-intervention stage</th>
<th>Post-intervention stage (at the end of 1st week)</th>
<th>t-value</th>
<th>95% Confidence interval of the difference</th>
<th>Effect size (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain intensity</td>
<td>Experiential group-I</td>
<td>7.73 (0.88)</td>
<td>7.13 (1.23)</td>
<td>11.50*</td>
<td>2.354 (3.913)</td>
<td>2.97 (Large)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>7.87 (0.83)</td>
<td>7.23 (0.99)</td>
<td>14.32*</td>
<td>3.458 (4.676)</td>
<td>3.70 (Large)</td>
</tr>
<tr>
<td>Abduction</td>
<td>Experiential group-I</td>
<td>60.0 (22.68)</td>
<td>54.33 (22.56)</td>
<td>16.0*</td>
<td>-7.601 (5.066)</td>
<td>4.13 (Large)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>68.33 (17.18)</td>
<td>62.13 (18.63)</td>
<td>6.97*</td>
<td>-16.564 (8.770)</td>
<td>1.80 (Large)</td>
</tr>
<tr>
<td>Flexion</td>
<td>Experiential group-I</td>
<td>84.0 (17.03)</td>
<td>78.33 (17.41)</td>
<td>16.0*</td>
<td>-9.293 (4.707)</td>
<td>4.13 (Large)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>94.33 (18.59)</td>
<td>88.50 (22.68)</td>
<td>5.67*</td>
<td>-14.702 (6.361)</td>
<td>1.46 (Large)</td>
</tr>
<tr>
<td>Medical rotation</td>
<td>Experiential group-I</td>
<td>28.33 (14.09)</td>
<td>22.43 (13.39)</td>
<td>8.50*</td>
<td>-7.146 (4.854)</td>
<td>2.19 (Large)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>34.67 (13.02)</td>
<td>29.43 (12.08)</td>
<td>7.79*</td>
<td>-12.328 (7.005)</td>
<td>2.01 (Large)</td>
</tr>
<tr>
<td>SPADI (shoulder pain disability index)</td>
<td>Experiential group-I</td>
<td>79.0 (12.70)</td>
<td>73.67 (8.75)</td>
<td>19.78*</td>
<td>39.115 (49.552)</td>
<td>5.11 (Large)</td>
</tr>
<tr>
<td></td>
<td>Experiential group-II</td>
<td>79.0 (14.17)</td>
<td>73.17 (6.45)</td>
<td>14.32*</td>
<td>40.246 (54.421)</td>
<td>3.70 (Large)</td>
</tr>
</tbody>
</table>

* significant at 0.05 levels (p < 0.05)

Furthermore, when examining the effect of one week of therapeutic intervention on the three dependent variables: pain intensity, shoulder range of motion, and SPADI, a significant difference is observed between
the two experimental groups. It is also inferred that there is a clinically significant difference in the post-intervention mean of pain, SPADI, and shoulder ROM with a large effect size. Furthermore, while considering the mean score of all the three outcome variables, Experimental group-II, which is treated with gong’s mobilization, is better than the Experimental group-I exposed to Spencer’s technique (Table 3). Specifically, the experimental group II, which was exposed to the treatment combinations of ultrasound therapy and Gong’s mobilization on a frozen shoulder, showed a better reduction in pain intensity (mean difference of 0.87; 95% CI: 0.318; 1.415, p < 0.05); shoulder range of motion (mean difference: ‘abduction’: 15.76; 95% CI: −25.970, 10.636, p < 0.05); Flexion (mean difference of 15.67; 95% CI: −23.605, 14.272, p < 0.05); Medial rotation (mean difference of 10.33; 95% CI: −15.158, 8.492, p < 0.05) and SPADI disability (mean difference of 7; 95% CI: −3.685, 9.685, p < 0.05) than the experimental group-I, which was exposed to the treatment combinations of ultrasound therapy and Spencer’s technique at 0.05 levels of significance.

Table 3. Analysis of Pain, ROM, self-rated upper-extremity disability of subjects between Gong’s Mobilization and Spencer’s Technique groups (Post-test analysis)

<table>
<thead>
<tr>
<th>Outcome Parameter</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>95% Confidence interval of the difference</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain intensity</td>
<td>Experiential Group-I</td>
<td>4.67</td>
<td>1.23</td>
<td>1.82*</td>
<td>0.318; 1.415</td>
<td>0.668</td>
</tr>
<tr>
<td></td>
<td>Experiential Group-II</td>
<td>3.80</td>
<td>1.37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abduction</td>
<td>Experiential Group-I</td>
<td>65.33</td>
<td>22.56</td>
<td>2.07*</td>
<td>−25.970; 10.636</td>
<td>0.757</td>
</tr>
<tr>
<td></td>
<td>Experiential Group-II</td>
<td>81.0</td>
<td>18.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>Experiential Group-I</td>
<td>89.33</td>
<td>17.41</td>
<td>2.12*</td>
<td>−23.605; 14.272</td>
<td>0.775</td>
</tr>
<tr>
<td></td>
<td>Experiential Group-II</td>
<td>105.0</td>
<td>22.68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medial Rotation</td>
<td>Experiential Group-I</td>
<td>34.0</td>
<td>13.59</td>
<td>2.22*</td>
<td>−15.158; 8.492</td>
<td>0.810</td>
</tr>
<tr>
<td></td>
<td>Experiential Group-II</td>
<td>44.33</td>
<td>12.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPADI (Shoulder pain disability index)</td>
<td>Experiential Group-I</td>
<td>38.67</td>
<td>8.75</td>
<td>2.49*</td>
<td>−3.685; 9.685</td>
<td>0.911</td>
</tr>
<tr>
<td></td>
<td>Experiential Group-II</td>
<td>31.67</td>
<td>6.45</td>
<td></td>
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</tr>
</tbody>
</table>

* significant at 0.05 levels (p < 0.05)

Discussion

This study was to compare the effectiveness of the Spencer technique and gong’s mobilization along with conventional therapy in frozen shoulder patients with an expectation to reduce Pain and disability and increase range of motion of shoulder joint.

After one week of intervention (5 sessions), subjects with frozen shoulders showed statistically and clinically substantial improvements in pain, functional impairment, and shoulder range of motion in both Gong’s and Spenser’s technique groups (Table 2). Besides, this study observed the calculated MCID values (threshold) for pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation ROM following Spencer’s technique as 0.70, 4.71, 2.07, 1.14, and 1.04 points, respectively. Therefore, it is found that 100% of subjects following Spencer’s technique have achieved the MCID threshold for pain, functional impairment, and shoulder ROM. On the other hand, the calculated MCID values (threshold) for pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation ROM following Gong’s mobilization technique were observed as 0.55, 6.40, 3.64, 3.52, and 2.40 points, respectively. Hence, it is inferred that 100% of subjects following Gong’s mobilization technique have achieved the MCID threshold for pain, functional impairment, and shoulder ROM. When compared to its pre-intervention score, the group treated with gong’s mobilization had a substantial reduction in pain as measured by VAS, functional disability as measured by SPADI, and improvement in shoulder range of motions such as flexion, abduction, and medial rotation. Such observed improvement is due to the effect of gong’s mobilization and an earlier study by Jyoti Rinku Dilip, et al. [18], also proved the efficacy of the gong’s mobilization in reducing pain among patients with frozen shoulder. The rhythmic oscillatory movements of Gong mobilization reduced pain by stimulating type-2 dynamic mechanoreceptors and inhibiting type-4 nociceptive receptors, which has neurophysiologic and mechanical effects. It also affects circulatory perfusion, thus it’s useful for treating reversible painful joints with limited motion and functionally fixed joints [12, 17, 18, 33].

Further, in this study, subjects treated with gong’s mobilization showed a significant improvement in the medial rotation range of motion, and it is in accordance with the findings of an earlier study that demonstrated an increase in shoulder medial rotation ROM in patients with a frozen shoulder [18]. In frozen shoulder patients, the medial rotation of the shoulder is restricted by the humeral head’s anterior displacement, and Gong’s mobilization technique creates posterior compression of the humerus head, putting the shoulder head in a normal position [17]. Abduction of the shoulder joint occurs when the humeral head is in a normal position, and as a result, normal muscle contraction occurs with rolling and sliding at the articular surface, and the tension of the posterior joint capsule is reduced [17]. During treatment, gong mobilization also corrects glenohumeral malalignment and generates appropriate acceleration [33].

In this study, it was discovered that patients who had a treatment combination of ultrasound therapy and Spencer’s mobilization experienced significant pain relief and improved shoulder range of motion. Spencer’s technique, in addition to the therapeutic effects of ultrasound, reduces pain by modifying circulatory pain biomarkers, and its passive rhythmic movement re-establishes the arthrokinemetics of gliding and rolling, restoring shoulder mobility [34]. Spencer’s approach restores specific joint motion while increasing pain-free range of motion by stretching the shoulder capsule and tight soft tissues. When used, this procedure
enhances lymphatic flow from the treatment area. As a result, the joint regains its full range of motion and neuronal reflexes are reset [35]. The traction, gliding, or passive repeating translation movements increase nutrition, circulation, and lubrication in the joint structures. It reverses the joint's negative alterations and restores arthokinematics gliding and rolling motion. Increased gliding will correct the osteokinematic rotation and allow shoulder mobility to be restored.

Spencer's approach also lowers or reduces the physical signs of somatic dysfunction, such as tissue modifications, tenderness, asymmetry, and restricted motion. This manipulative approach alters the levels of circulatory pain biomarkers, which is the underlying mechanism for pain relief. Several circulatory biomarkers' concentrations were altered following treatment; changes from baseline levels of these biomarkers occurred instantly and 24 hours later. As a result, all of the above-mentioned mechanisms of Spencer's approach may have resulted in a decrease in pain levels and better shoulder joint mobility in this study.

Another physiological mechanism behind the effectiveness of Spencer's technique is that it uses soft tissue stretching and fluid mobilization to improve glenohumeral and scapulothoracic joint mobility [36]. It treats the most pain-free motions first, then the most restricted motions, to increase shoulder complex mobility. Low threshold mechanoreceptors in joints and muscles are stimulated during Spencer's muscle energy technique. It causes the somatic efferent to generate a sympathoexcitation stimulus, which aids in the localization of activation in the periaqueductal grey matter in the midbrain. By closing the gate, nociceptive inhibitors from the midbrain block nociceptive impulses in the dorsal horn of the spinal cord. As a result, pain is controlled or suppressed by activating mechanoreceptors in joints and muscles in this pain gate pathway [37].

In addition, the findings of this study showed a statistically significant difference between the groups while considering the pain intensity, disability index, and shoulder range of motion in those subjects diagnosed to have frozen shoulders (Table 3). The group which was treated with gong's mobilization showed better results in all the three parameters such as pain, disability, and range of motion of shoulder when compared with those treated with the spencer technique. The greater effect of gong's mobilization is due to the fact that it has been administered in the end-range, which is the factor that has maintained anterior to posterior gliding and gives immediate results. The majority of joint mobilization procedures attempt to increase shoulder medial rotation range of motion, and anterior to posterior gliding is done in the supine position. In the static state, however, anterior to posterior gliding keep the humeral head in a normal position, but it does not keep it in a normal posture during dynamic movement. As a result, Gong's mobilization allows for shoulder medial rotation with the humeral head in a normal position against the glenoid cavity of the scapula, resulting in a better shoulder medial rotation range of motion than the group treated with Spencer's approach. The key benefit of Gong's Mobilization, according to an earlier study, is that it has an immediate effect and does not require medical rotation to enhance abduction, which can be beneficial in frozen shoulder patients who have a significant limitation of medial rotation [17].

The observed improvement in the functional disability in both groups in this study might be due to the secondary effect of the reduction of pain and improved range of motion that resulted from the application of both gong's mobilization and spencer's technique. Moreover, the study is designed in such a manner where ultrasound therapy was applied to both the treatment groups as it was found to produce a significant effect in treating frozen shoulders [20-23]. In addition, both groups were encouraged to do Codman's Pendulum exercise at home, which is an effective strategy for stretching and mobilizing shoulder joints affected by Capsulitis. The combination of ultrasound therapy and these home exercises may have contributed to the observed improvements in outcome parameters. Furthermore, the study does not have a comparison with a control group who received only ultrasound and Codman's pendular exercises and their effect on the outcome parameters. Further research is warranted to uncover the individual effectiveness of these treatment combinations. There is some limitation in this study, and it consists of the duration of the treatment protocol being short i.e., 1-week, small sample size, only specific shoulder movements such as flexion, abduction, and medial rotation range of motion were measured.

**Clinical significance of this study**

Despite the lack of a well-defined paradigm for the treatment of frozen shoulder, a wide range of beneficial treatments, both surgical and non-surgical, are available. The therapeutic management of frozen shoulder frequently differs significantly across clinicians and is based on personal experience rather than published research. This study contributed to the body of knowledge that both Gong's mobilization and the Spencer technique are found to have short-term effects on pain, functional disability, and shoulder range of motion. Further, Gong's mobilization is found to be more clinically significant than Spencer's approach, with greater improvements in shoulder flexion, abduction, medial rotation ROM, and functional disability. In addition, the study also provides evidence to the clinicians that Gong's mobilization with ultrasound therapy and a unique set of Codman pendular exercises can be used in combination with the physiotherapy treatment plan for patients with frozen shoulders. From the patients' perspectives, this study's findings will help understand the causes of frozen shoulder and how to manage it physiotherapeutically with the latest advanced techniques with pain-free, immediate, and short-term improvement. This study will also add evidence to the researcher’s knowledge of combined therapeutic interventions' effectiveness in managing
frozen shoulder. Although there is a dearth of high-level evidence in the literature to support this approach, Gong's mobilization and Spencer technique, frequently with adjuncts, is the favored first-line treatment.

Limitations

There are a few limitations to this study that should be taken into account. First, the sample size for this study is small in both experimental groups, making it impossible to extrapolate the findings to the entire population. The clinical trial was also short-term, with both experimental groups receiving only five treatment sessions. In this study, there was no control or placebo group. The long-term effect of Gong's mobilization or Spencer's technique was not studied or explained in this study because there was no long-term follow-up to determine the actual effect. The participants' everyday activities were not observed, which could have influenced the study's outcome. Few studies on the frozen shoulder have been conducted in India, and there has been very little research on Gong and Spencer's technique, resulting in a scarcity of useful knowledge on this technique and frozen shoulder in India.

Recommendations

Further research on Gong's mobilization and Spencer's muscular energy technique with a large number of subjects and a long-time frame is recommended. To improve the quality of research, strict randomization and a standardized blinding approach are recommended. It is suggested that further data be collected in the future to determine the long-term effects of Gong's mobilization and Spencer's technique. It is preferable to monitor everyday activities during intervention periods that have the potential to influence the outcome. It is recommended to conduct experimental research on the effects of Gong's mobilization and Spencer's muscle energy technique with or without other modalities and manual therapy procedures to find their actual effectiveness.

Conclusions

The present study concluded that both Gong's mobilization and the Spencer technique were found to have short-term effects on pain, functional disability, and shoulder range of motion. However, Gong's mobilization was found to be clinically more significant than Spencer's technique, with a greater improvement in shoulder flexion, abduction, medial rotation ROM, and functional disability in subjects with frozen shoulder. Also, the study confirms that, clinically, Gong's mobilization with ultrasound and a unique set of Codman pendular exercises can be used in combination for the physiotherapy treatment protocol for patients with frozen shoulder. However, future studies can be performed with a larger sample size while the duration of the treatment protocol could be extended for a longer period to ascertain the long-term effectiveness of the improvement obtained.

Disclosure statement

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Conflict of interest

Authors state that there is no conflict of interest.

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References


