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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). The study aimed to compare the effectiveness of Gong's mobilization and Spencer technique in reducing pain and functional disability, and improving shoulder ROM in FS patients.

Methods. A pretest-posttest experimental study design was adopted; 30 patients diagnosed with unilateral FS were selected and randomized into 2 groups of 15 with a simple random technique. Experimental group I (EG-I) received Spencer technique and ultrasound therapy, with Codman's pendulum exercise (CPE). Experimental group II (EG-II) received Gong's mobilization technique and ultrasound therapy, with CPE. The intervention lasted for 5 days and consisted of 1 session every day. Three variables were assessed to study the treatment effectiveness before the intervention and at the end of the first week: (i) pain intensity as measured with the visual analogue scale; (ii) shoulder ROM as measured with a goniometer (abduction, flexion, and medial rotation); (iii) functional disability as measured with the Shoulder Pain and Disability Index (SPADI).

Results. EG-II showed a better reduction in pain intensity (mean difference [MD]: 0.87) and SPADI (MD: 7), and increase in shoulder ROM (MD: abduction: 15.76; flexion: 15.67; medial rotation: 10.33) than EG-I at 0.05 levels of significance.

Conclusions. Gong's mobilization was found to be more effective than Spencer 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, also known as adhesive capsulitis, 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 is inflamed and thick, and stiff connective tissue surrounds the shoulder joint [2]. The condition is known as 'frozen' shoulder because the more painful the shoulder becomes, the less likely it is that 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 and 10–29% of patients with diabetes are prone to this problem [6]. Frozen shoulder affects significantly more women than males and occurs more frequently in the non-dominant arm [1]. It is mostly observed in adults aged 40–60 years, only rarely affecting those under the age of 40. About 12% of patients present with symptoms on both sides, which indicates a genetic tendency [1].

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 for 6–9 months. The second stage, the 'frozen' stage, sees no worsening of the pain, which may even improve; nonetheless, the shoulder stays stiff for 4–6 months and movement may be limited. Finally, the third stage, known as 'thawing,' might take from 6 months to 2 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 medication, 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-velocity low-amplitude thrust, end-range-mid-range mobilization, Spencer 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 frozen shoulder [11]. An earlier study found that Gong's mobilization was a valuable treatment option in the clinical context since it immediately improved the range of motion

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[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 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 joint function, while also having a good impact on the emotional, social, and cognitive domains. Spencer technique is a 7-procedure articulatory approach for treating shoulder limitation caused by frozen shoulder. Contracted muscles, ligaments, and capsules are stretched by 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 shoulder [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].

Although studies have shown that Gong's mobilization and Spencer technique are both beneficial in treating frozen shoulder, it would be interesting to see which is more effective. Therefore, the purpose of this study was to assess the efficacy of Gong's mobilization and Spencer technique when combined with ultrasound therapy and shoulder exercises. Specifically, the authors conducted this research (i) to examine the effectiveness of Gong's mobilization in reducing pain and functional disability and improving range of motion in patients with frozen shoulder; (ii) to examine the effectiveness of Spencer technique combined with ultrasound therapy in reducing pain and improving range of motion in patients with frozen shoulder; and (iii) to compare 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 in frozen shoulder patients was evaluated by using a pretest-posttest experimental study design with 2 different intervention groups.

Subjects

All patients complaining of shoulder pain visiting the Department of Physiotherapy, Co-Operative Institute of Health Sciences, Thalassery, Kerala state, India, formed the population for this study. Among them, those diagnosed with unilateral frozen shoulder (n = 33) 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 the individuals with unilateral frozen shoulder and include them in the sampling frame: (i) any gender, age of 50–60 years; (ii) unilateral frozen shoulder with pain lasting for more than 1 month; (iii) capsular pattern of motion restriction; and (iv) more than 50% loss of passive movement of the shoulder joint compared with 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 constituted exclusion criteria. On the basis of both inclusive and exclusive criteria, 3 patients were excluded, which made a total of 30 study participants. The total duration of the study was 6 months.

Randomization

The subjects were assigned to 2 groups by using a simple random sampling approach. As such, each individual was asked to draw an envelope from a concealed box; each envelope contained a red or blue card, and on the basis of the selection, the patients were assigned to one of the 2 groups of the study. The person who handled the concealed box was not involved in the study. The subjects who picked red cards were assigned to group I, and those who picked blue cards were assigned to group II, as depicted in Figure 1.

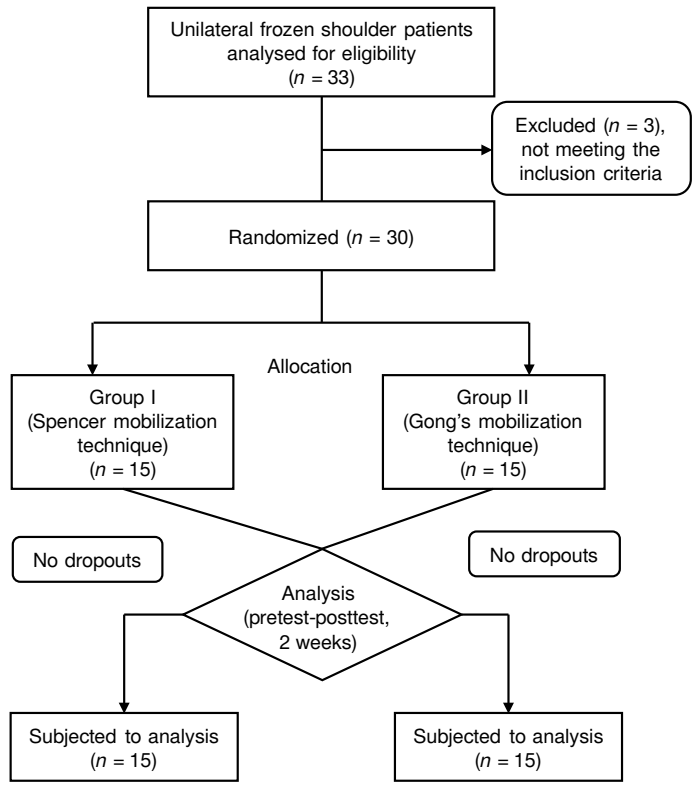

Figure 1. The study flow chart

Methods

A pilot study was conducted to estimate the sample size per group with the formula proposed in a previous study by Sakpal [24]. The mean change in the visual analogue scale (VAS) scores after Spencer technique and Gong's mobilization technique application was calculated. Subsequently, it was observed that 13 subjects in each group would be ad-

Table 1. Pre-intervention analysis of pain, range of motion, and self-rated upper-extremity disability in subjects in Gong's mobilization and Spencer technique groups

Outcome parameter		Groups	Mean	*SD*	*t*	95% CI of the difference		Effect size (*r*)
						Lower	Upper	
Pain intensity		Experimental group I	7.73	0.88	0.22 (p = 0.831)*	–0.639	0.505	0.164 (small)
		Experimental group II	7.87	0.83				
Range of motion	Abduction	Experimental group I	60.0	22.68	0.17 (p = 0.863)*	–18.224	15.557	0.414 (medium)
		Experimental group II	68.33	17.18				
	Flexion	Experimental group I	84.0	17.03	0.13 (p = 0.896)*	–18.266	16.266	0.579 (medium)
		Experimental group II	94.33	18.59				
	Medial rotation	Experimental group I	28.33	14.09	0.07 (p = 0.947)*	–11.937	12.604	0.467 (medium)
		Experimental group II	34.67	13.02				
Shoulder Pain and Disability Index		Experimental group I	79.0	12.70	0.00 (p = 1.00)*	–11.840	11.840	0.000 (small)
		Experimental group II	79.0	14.17				

* non-significant ($p > 0.05$)

equate 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. With the anticipation of a 10% dropout rate, the study fixed the sample size per group as 15. Before being subjected to the chosen treatment procedures, all subjects were randomized into 2 groups of 15 by using a simple random technique. All patients (n = 30) were identified at the pre-treatment level in terms of the outcome parameters, as evidenced by the value of $p > 0.05$ (Table 1). The subjects in experimental group I received ultrasound therapy, as well as Spencer mobilization technique, whereas those in experimental group II received ultrasound therapy, as well as Gong's mobilization technique. Both groups were provided with 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 for 5 days and consisted of 1 session every day, excluding the weekend (i.e., 5 sessions per week). Three variables were used to assess the treatment technique effectiveness: (i) pain intensity as measured with VAS; (ii) shoulder range of motion as measured with a goniometer (shoulder abduction, flexion, and medial rotation); and (iii) functional disability as measured with the Shoulder Pain and Disability Index (SPADI). VAS [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 the 30 patients.

Experimental interventions

Gong's mobilization technique

The Gong's mobilization approach used in this study was based on the instructions by Gong et al. [12]. The subject was placed in a side-lying position with the affected shoulder joint facing upward. The patient's shoulder was abducted at 90° to maintain the humerus vertical position and the flexed elbow joint in a 90° position. The therapist used one hand to keep the subject's elbow joint at 90°, with own elbow below the patient's elbow joint, and the other hand to press the humerus head from anterior to posterior. The therapist next elevated their 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°. 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 range of motion, oscillation at Maitland's grades 3 and 4 was performed, followed by 7 seconds of prolonged stretching at the grade 4 technique.

Spencer technique

The Spencer technique adopted in this study was based on the guidelines provided by Nicholas [28] and Knebl et al. [29]. The patient was resting on their side, with the affected shoulder raised. In 7 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, circumduction with compression, shoulder flexion, circumduction with distraction, abduction, adduction with internal rotation, and glenohumeral pump were the exercises performed. The patients were advised to employ their muscle energy technique against the small resistance provided by the therapist for 3–5 seconds throughout each movement. Over the course of 5 days, the exercise was repeated 3–5 times per session, with rest breaks.

Ultrasound therapy

During the intervention period, all patients received 5 sessions of pulsed ultrasound therapy around the shoulder joint, each lasting for 8 minutes, with 1 minute on and 1 minute off at a frequency of 3 MHz and an intensity of 1.5 W/cm^2.

Home-based exercise program

In addition to the therapeutic intervention described above, all individuals in both experimental groups implemented a common set of Codman's pendulum exercises at home, 5 times daily, in 5–10-minute sessions: (1) Bend at the waist so that the affected arm is dangling down. Holding onto a table or chair for support was allowed. Gently rock the 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 movement in the opposite direction. The patients were instructed to do this 5 times in each direction. (2) Bend at the waist so that the affected arm is dangling down. Holding onto a table or chair for support was allowed. Move the affected arm forward and backward and swing freely. Do this 5 times in each direction. (3) Bend at the waist so that the affected arm is dangling down. Holding onto a table or chair for support was allowed. Move the affected arm side to side and swing freely. The patients were instructed to do this 5 times in each direction.

Statistical analysis

Data were analysed by using the Statistical Package for the Social Sciences (SPSS) for Windows, version 21.0. A 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 served to assess the effectiveness of treatment between the 2 intervention groups for the 3 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 between the time points [30, 31]. Also, the standard deviation approach, which is a distribution-based method [32], was used to determine the minimum clinically important difference (MCID) in pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation range of motion after the application of both Gong's mobilization and Spencer 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 Ethics Committee of Co-Operative Institute of Health Sciences (decision No.: 06/2018/MPT/Musculoskeletal & Sports/CIHS).

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

No dropouts of subjects were observed in the study, and there were no adverse events reported during the treatment. The data of all the participants (n = 30) were subjected to statistical treatment with 0.05 levels of significance. From the analysis, it was inferred that there was no significant difference in the mean score of any dependent variable prior to the application of the selected therapeutic interventions, as revealed through an unpaired *t*-test with 0.05 levels of significance. Furthermore, no clinically significant difference was observed in the pre-intervention mean scores 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, or external rotation, with a medium effect size (Table 1).

In both experimental groups, a further attempt was made to study whether any significant difference would be found in the dependent variables between the 2 specific time points (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, significant reductions in pain intensity, improvements in shoulder range of motion, and reductions in SPADI were observed in both experimental groups at 0.05 levels of significance, as shown in Table 2. Also, it was noted that there was a clinically significant reduction in pain and

Table 2. Pre- vs. post-intervention analysis of pain, range of motion, and self-rated upper-extremity disability in subjects in Gong's mobilization and Spencer technique groups

Outcome parameter		Groups	Pre-intervention stage		Post-intervention stage (at the end of 1st week)		*t*	95% CI of the difference		Effect size (*r*)
			Mean	*SD*	Mean	*SD*		Lower	Upper	
Pain intensity		Experimental group I	7.73	0.88	4.67	1.23	11.50*	2.354	3.913	2.97 (large)
		Experimental group II	7.87	0.83	3.80	0.37	14.32*	3.458	4.676	3.70 (large)
Range of motion	Abduction	Experimental group I	60.0	22.68	65.33	22.56	16.0*	–7.601	–5.066	4.13 (large)
		Experimental group II	68.33	17.18	81.0	18.63	6.97*	–16.564	–8.770	1.80 (large)
	Flexion	Experimental group I	84.0	17.03	89.33	17.41	16.0*	–9.293	–4.707	4.13 (large)
		Experimental group II	94.33	18.59	105.0	22.68	5.67*	–14.702	–6.631	1.46 (large)
	Medial rotation	Experimental group I	28.33	14.09	34.0	13.39	8.50*	–7.146	–4.854	2.19 (large)
		Experimental group II	34.67	13.02	44.33	12.08	7.79*	–12.328	–7.005	2.01 (large)
Shoulder Pain and Disability Index		Experimental group I	79.0	12.70	38.67	8.75	19.78*	39.115	49.552	5.11 (large)
		Experimental group II	79.0	14.17	31.67	6.45	14.32*	40.246	54.421	3.70 (large)

* significant ($p < 0.05$)

Table 3. Post-intervention analysis of pain, range of motion, and self-rated upper-extremity disability in subjects in Gong's mobilization and Spencer technique groups

Outcome parameter		Groups	Mean	*SD*	*t*	95% CI of the difference		Effect size (*r*)
						Lower	Upper	
Pain intensity		Experimental group I	4.67	1.23	1.82*	0.318	1.415	0.668 (large)
		Experimental group II	3.80	1.37				
Range of motion	Abduction	Experimental group I	65.33	22.56	2.07*	–25.970	10.636	0.757 (large)
		Experimental group II	81.0	18.63				
	Flexion	Experimental group I	89.33	17.41	2.12*	–23.605	14.272	0.775 (large)
		Experimental group II	105.0	22.68				
	Medial rotation	Experimental group I	34.0	13.39	2.22*	–15.158	8.492	0.810 (large)
		Experimental group II	44.33	12.08				
Shoulder Pain and Disability Index		Experimental group I	38.67	8.75	2.49*	–3.685	9.685	0.911 (large)
		Experimental group II	31.67	6.45				

* significant ($p < 0.05$)

disability scores and improvement in shoulder range of motion, with a large effect size, in both experimental groups after their respective treatment interventions.

Furthermore, when examining the effect of 1 week of therapeutic intervention on the 3 dependent variables: pain intensity, shoulder range of motion, and SPADI, a significant difference was observed between the 2 experimental groups. It was also inferred that there was a clinically significant difference in the post-intervention mean of pain, SPADI, and shoulder range of motion values, with a large effect size. Moreover, with regard to the mean score of all the 3 outcome variables, experimental group II, which was treated with a combination of ultrasound therapy and Gong's mobilization for frozen shoulder, turned out better than experimental group I, exposed to a combination of ultrasound therapy and Spencer technique (Table 3). Specifically, experimental group II showed a higher improvement in pain intensity (mean difference: 0.87; 95% CI: 0.318–1.415; $p < 0.05$), shoulder range of motion [abduction (mean difference: 15.76; 95% CI: –25.970 to 10.636; $p < 0.05$), flexion (mean difference: 15.67; 95% CI: –23.605 to 14.272; $p < 0.05$), medial rotation (mean difference: 10.33; 95% CI: –15.158 to 8.492; $p < 0.05$)], and SPADI score (mean difference: 7; 95% CI: –3.685 to 9.685; $p < 0.05$) than experimental group I, with 0.05 levels of significance.

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 the shoulder joint.

After 1 week of intervention (5 sessions), the subjects with frozen shoulder showed statistically and clinically significant improvements in pain, functional impairment, and shoulder range of motion in both the Gong's mobilization and Spencer technique groups (Table 2). Besides, the calculated MCID values (threshold) for pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation range of motion after Spencer technique application equalled 0.70, 4.71, 2.07, 1.14, and 1.04 points, respectively. Therefore, it was found that 100% of subjects exposed to Spencer technique achieved the MCID threshold for pain, functional impairment, and shoulder range of motion. In turn, the calculated MCID values (threshold) for pain (VAS), functional impairment (SPADI), flexion, abduction, and medial rotation range of motion after Gong's mobilization technique application equalled 0.55, 6.40, 3.64, 3.52, and 2.40 points, respectively. Hence, it was inferred that 100% of subjects exposed to Gong's mobilization technique achieved the MCID threshold for pain, functional impairment, and shoulder range of motion. When compared with the pre-intervention score, the group treated with Gong's mobilization exhibited a substantial reduction in pain as measured with VAS and functional disability as measured with SPADI, as well as improvement in shoulder range of motion for flexion, abduction, and medial rotation. Such observed improvement is due to the effect of Gong's mobilization. An earlier study by Dilip et al. [18] also proved the efficacy of Gong's mobilization in reducing pain among patients with frozen shoulder. The rhythmic oscillatory movements of Gong's mobilization reduced pain by stimulating type 2 dynamic mechanoreceptors and inhibiting type 4 nociceptive receptors, which exerted neurophysiologic and mechanical effects. The technique also influences circulatory perfusion; thus, it is useful for treating reversible joint pain associated with limited motion and functional impairment [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 range of motion in patients with frozen shoulder [18]. In frozen shoulder patients, the medial rotation of the shoulder is restricted by the humeral head anterior displacement, and Gong's mobilization technique creates posterior compression of the humerus head, putting the shoulder head in the normal position [17]. Abduction of the shoulder joint occurs when the humeral head is in its normal position; as a result, normal muscle contraction is possible with rolling and sliding at the articular surface, and the tension of the posterior joint capsule is reduced [17]. During treatment, Gong's mobilization also corrects glenohumeral malalignment and generates appropriate acceleration [33].

In the presented study, it was discovered that patients who received a treatment combination of ultrasound therapy and Spencer mobilization experienced significant pain relief and improved shoulder range of motion. Spencer technique,

in addition to the therapeutic effects of ultrasound, reduces pain by modifying circulatory pain biomarkers, and its passive rhythmic movement re-establishes the arthrokinematics of gliding and rolling, restoring shoulder mobility [34]. Spencer approach brings back specific joint motion while increasing pain-free range of motion by stretching the shoulder capsule and tight soft tissues. The 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. The technique reverses negative joint alterations and restores the arthrokinematics of the gliding and rolling motion. Increased gliding corrects osteokinematic rotation and allows shoulder mobility to be restored.

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

Another physiological mechanism behind the effectiveness of Spencer 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 muscle energy technique. This makes the somatic efferent neurons 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 study revealed a statistically significant difference between the groups concerning pain intensity, disability index, and shoulder range of motion in subjects diagnosed with frozen shoulder (Table 3). The group treated with Gong's mobilization showed better results in all the 3 parameters than the one managed with Spencer technique. The greater effect of Gong's mobilization is due to the fact that the technique was administered in the end-range, which is the factor that maintained anterior-to-posterior gliding and provided immediate results. The majority of joint mobilization procedures attempt to increase shoulder medial rotation range of motion, and anterior-to-posterior gliding is performed in the supine position. In the static state, however, anterior-to-posterior gliding keeps the humeral head in the normal position, but it does not keep it in its normal posture during dynamic movement. As a result, Gong's mobilization allows for shoulder medial rotation with the humeral head in the normal position against the glenoid cavity of the scapula; this led to a better shoulder medial rotation range of motion than in the group treated with Spencer approach. The key benefit of Gong's mobilization, according to an earlier study, is that it has an immediate effect and does not require medial rotation to enhance abduction, which can be advantageous in frozen shoulder patients with 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 pain reduction and improved range of motion, which resulted from the application of both Gong's mobilization and Spencer technique. Moreover, the study was designed in such a manner that ultrasound therapy was applied to both treatment groups as it had been found to produce a significant effect in treating frozen shoulder [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 the outcome parameters.

Limitations

There are a few limitations to this study that should be taken into account. First, the sample size was small in both experimental groups, making it impossible to extrapolate the findings to the entire population of frozen shoulder patients. The clinical trial was also short-term, with both experimental groups receiving only 5 treatment sessions. Therefore, the long-term effect of Gong's mobilization or Spencer technique was not studied or explained. Moreover, the range of motion of specific shoulder movements only was measured, such as flexion, abduction, and medial rotation.

Furthermore, the study did not present a comparison with a control group receiving only ultrasound and Codman's pendulum exercises. Further research is warranted to uncover the individual effectiveness of this treatment combination.

The participants' everyday activities were not observed although they could have influenced the study outcomes.

Clinical significance of the 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 contributes to the body of knowledge that both Gong's mobilization and Spencer technique are found to have short-term effects on pain, functional disability, and shoulder range of motion. Further, Gong's mobilization is observed to be more clinically effective than Spencer approach, with greater improvements in shoulder flexion, abduction, medial rotation range of motion, and functional disability. In addition, the study also provides evidence to clinicians that Gong's mobilization, ultrasound therapy, and a unique set of Codman's pendulum exercises can be used in combination as a physiotherapy treatment plan for patients with frozen shoulder. From the patients' perspective, the findings of this study will help understand the causes of frozen shoulder and its physiotherapeutic management with the latest advanced techniques, with pain-free, immediate, and short-term improvement. This research will also add evidence to the knowledge of the effectiveness of combined therapeutic interventions in frozen shoulder treatment. 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, constitute the favoured first-line treatments.

Few studies on frozen shoulder have been conducted in India, and there has been very scarce research on Gong's mobilization and Spencer technique, which results in limited

access to useful knowledge on these modalities and frozen shoulder in India.

Recommendations

Further research on Gong's mobilization and Spencer 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 should be applied. It is suggested that further data be collected in the future to determine the long-term effects of Gong's mobilization and Spencer technique. It is preferable to monitor everyday activities during the intervention periods as they have a potential to influence the outcome. It is recommended to conduct experimental research involving Gong's mobilization and Spencer muscle energy technique with or without other modalities or manual therapy procedures to determine their actual effectiveness.

Conclusions

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

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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