Effectiveness of Gong’s mobilization on pain and functional ability in patient with Periarthritis shoulder

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Abstract
Periarthritis (PA) shoulder is a self-limiting condition with unknown etiology that is characterized by painful and limited active and passive range of motion (ROM). Mobilization technique have proven effective in reducing pain and improving ROM, thereby increasing functional ability of shoulder. However, there are very few literatures available suggesting the effectiveness of gong’s mobilization in the treatment of PA shoulder, so the present study was done to find out the effectiveness of gong’s mobilization on pain and functional ability in patient with Periarthritis shoulder. Thirty subjects were chosen at random and divided into two groups. Group A (N=15) was treated with gong’s mobilization technique, ultrasound and Codman’s pendulum exercise. Group B (N=15) was treated with ultrasound and Codman’s pendulum exercise. The initial evaluation of pain intensity by NPRS, shoulder ROM by universal goniometry, and functional disability were scored using constant score. The significant improvement in NPRS (t=12.13, p=0.001) and shoulder abduction (t=11.42, p=0.001) and shoulder medial rotation (t=10.98, p=0.001) and shoulder constant score (t=10.44, p=0.001) was observed in patients with Group A. The significant improvement in NPRS (t=11.50, p=0.001) and shoulder abduction (t=16.10, p=0.001) and shoulder medial rotation (t=12.93, p=0.001) and shoulder constant score (t=8.79, p=0.001) was observed in patients with Group B. The study result concludes that in patients with periarthritis shoulder, the Gong’s mobilization technique is effective in decreasing pain, improving ROM (medial rotation and abduction), and functional disability. However, the patients who received the gong’s mobilization technique showed better improvement than the control group.

Keywords: Gong’s Mobilization Technique, Conventional therapy, Periarthritis shoulder, Shoulder abduction, and medial rotation ROM, Shoulder Constant Score.
Introduction

The shoulder is a synovial joint. It is mostly a freely mobile joint. Shoulder joint get excessive mobility at cost at of its own stability. The most important articulation is glenohumeral joint, acromioclavicular joint, sternoclavicular joint and scapulothoracic articulation. Shoulder joint is an unstable joint because head of the humerus is larger than glenoid fossa of scapula. These joint on the interaction of both static and dynamic stability. The static stabilizer structure includes the bony anatomy, negative intra-articular pressure, glenoid labrum, and the glenohumeral ligament along with the joint capsule. The dynamic stabilizer structure includes rotator cuff muscles and other muscle structure surrounding the shoulder joint.

Periarthritis (PA) shoulder is one of the common conditions in the shoulder joint. It is an unknown etiological condition characterized by a significant restriction of active and passive shoulder movement without any known intrinsic shoulder disorder. This condition is characterized by thickening of the synovial capsule, contracted soft tissues and adhesion to the biceps tendon and/or obliteration of the axillary fold secondary to adhesion which results in an insidious and progressive loss of active and passive mobility in the GH joint due to joint contracture. PA shoulder is a common shoulder problem between 40 to 60 years. It is reported to affect 2 to 5% of the general population, increasing to 10-38% in patients with diabetes and thyroid disease. Women are more affected than the men with the involvement of the dominant side more.

The clinical guideline of the American Academy of Orthopedic Surgeons (AAOS) describes the following definition of the PA shoulder. “It is a condition of uncertain etiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of another known intrinsic shoulder disorder.” Passive mobility is limited in the capsular pattern, with external rotation being most limited followed by abduction and internal rotation. The PA shoulder of is divided into two categories: primary and secondary. The development of the primary PA shoulder is usually idiopathic [this happens for no attributable reason]. Even those with primary PA shoulder have a very slow, gradual onset and progression of symptoms, with no precipitation event or mechanism of injury identified.

Secondary PA shoulder develops from a known cause, such as stiffness following arm injury, surgery, or prolonged immobilization. It is also stated that the presence of such medical co morbidities is also associated with increased pain and dysfunction. The secondary PA shoulder is divided into three sub-categories. 1. Systemic, 2. Extrinsic factors, 3. Intrinsic factors.

Symptoms are usually classified in three stages, as they worsen gradually and then resolve within a 2- to 3-year period. The AAOS describe three stages: 1. Freezing or painful stage: Pain increases gradually, making shoulder motion harder and harder. Pain tends to be worse at night. This stage can last from 6 weeks to 9 months. 2. Frozen stage: Pain does not worsen, and it may decrease at this stage. The shoulder remains stiff. It can last from 4 to 6
months, and movement may be restricted. 3. Thawing stage: Movement gets easier and may eventually return to normal. Pain may fade but occasionally recur. This takes between 6 months and 2 years.10

Multiple interventions for the treatment of frozen shoulder such as corticosteroid injections, surgery, patient education, cryotherapy, modalities (SWD, TENS, UST), moist heat, joint mobilization, stretching, strengthening exercises have been described in order to restore function by reducing inflammation and pain and thus allowing the restoration of normal shoulder mechanics.11

Joint mobilization techniques are assumed to induce various beneficial effects including neurophysiological, biomechanical and mechanical effects. Mobilization has a positive effect on treatment of frozen shoulder12. Wontae Gong is professor at the department of physical therapy, Gumi collage from republic of korea 13,16. Gong's mobilization technique is end range mobilization technique in which a corrective antero-posterior glide is applied with the shoulder in the dynamic position, followed by distraction and performing the restricted movement and then oscillation at Maitland’s grade 3 and 4 is given with sustained stretching14. This technique helps in the relief of physical pain as well as the distraction of the mind from stress. It is a corrective antero-posterior glide used for shoulder distraction and restricted movements in order to reduce pain and improve range of motion15. So, the aim of the study was to evaluate the effectiveness of gong’s mobilization in the management of Periarthritis shoulder.

Methods
In this study, 30 participants were selected using a random sampling method based on selection criteria, and informed consent was obtained from each participant and ethical clearance was obtained from the institution before the commencement of the study and were randomly assigned into two groups. Group A were treated with gong’s mobilization along with UST, Codman’s pendulum exercise, while Group B were treated with UST and Codman’s pendulum exercise. Shoulder pain, shoulder ROM and functional ability were measured using NPRS, Universal Goniometry and Shoulder constant score for both groups. The above evaluations were carried out on the first visit before beginning of treatment and again on the final day of treatment at the end of the 6th day. The study was undertaken at the, department of PMR, RMMCH, Annamalai university Jan. 2019 to June 2019.

Sampling
The PA shoulder patients were chosen using systematic sampling. After meeting the selection criteria, every second patient diagnosed with the condition in the outpatient department was chosen.

Selection Criteria for PA Shoulder
Inclusion criteria: Primary PA shoulder age between 40 to 65 years, both male and female were selected, unilateral involvement, duration of the condition between 3to 14 months, exclusion criteria: intra-articular injections in the affected shoulder for the last three months, fracture and
dislocation of glenohumeral joint, shoulder surgery, cervical radiculopathy, shoulder tendon tear and degenerative changes in the shoulder joint.

**Treatment procedure**

The treatment procedure was administered six days. The frequency was one session a day, three set of 10 repetitions with 5 sec rest between sets. Before mobilization, all participants were received UST treatment and is advised to perform the Codman’s pendulum exercise.

**Gong’s mobilization for improving shoulder medial rotation**

**Procedure:**

Patient in side lying position with edge of couch. The involved shoulder joint upward and shoulder was abducted at 90 degrees. The therapist kept the subject’s elbow. Joint at 90 degrees with one hand, placed his elbow below the subject’s elbow joint, and pressed the humerus head from anterior to posterior with the other hand. Then, the therapist held the vertical axis of the humerus steady by maintaining the shoulder abduction and the elbow at 90 degrees and raise therapist own body while slightly pulling on the articular capsule of the shoulder joint. This slight pulling of the articular capsule was maintained for 10–15 seconds then relaxed for 5 seconds. This technique was performed for about 2 to 3 minutes. After extending the articular capsule by slightly pulling it, the therapist used one hand to press the shoulder joint from anterior to posterior in order to prevent vertical pulling of the slightly extended articular capsule and the humerus. The therapist supported the elbow with the other hand and performs shoulder medial rotation. Then, in order to increase ROM, oscillation at Maitland’s grades 3 and 4 will be performed followed by sustained stretching at grade 4 for about 7 seconds\(^{16-19}\).

![Figure 1: Gong’s mobilization for medial rotation](image-url)
Gong’s mobilization technique improving shoulder abduction

Procedure:

The subject sat on knee-high chair with the spine in a neutral position and comfortably extends both their arms. Therapist stood on the side opposite to the affected side. The therapist pushed the scapula of the affected side in a posterior to anterior direction with one hand, and pushed the humeral head in an anterior to posterior direction parallel to joint plane with the other hand. Simultaneously, the subject was asked to quickly and powerfully perform shoulder abduction with elbow flexion and with palm facing inside and the back of the hand facing outside. During this time, the hands of the therapist kept facing the humeral head with long axis of the palm along with the long axis of the humerus. The therapist followed the subject performing shoulder abduction, at the same speed while maintaining a little distraction, and adding acceleration in the end range. The glide was sustained during slow active shoulder movements to the end of the pain-free range and release after return to the starting position. The procedure was performed in one set of 10 repetitions, with 1 minute rest between sets16-19.

Figure 2: Gong’s mobilization for abduction

Codman’s pendulum exercise

Bent forward at the waist back parallel to ground is ideal. Allow involved arm to hang down, perpendicular to the floor keep arm and shoulder muscles relaxed. Move arm slowly, increasing the arc as tolerated: front to back, side to side, clockwise circles, counter.
Evaluation procedure

Numerical Pain Rating Scale (NPRS)\(^{20}\)

The NPRS was used to measure pain intensity of the subject. The subject sat on a chair and was requested to mark the severity of resting pain from 0 as “no pain” to 10 as “severe pain” on a 10 cm line.

![Pain Score 0-10 Numerical Rating](image)

Goniometry measurement for shoulder ROM\(^{21}\)

**Shoulder abduction:**

The patient is in the supine lying position. The axis are taken one inch below the acromion process of the scapula. The movable arm is placed over the midline of the anterior side of the arm and is held in the right hand of the therapist. It is placed on the clavicle horizontally and is held by the therapist left hand. The therapist’s right hand performs the shoulder abduction movement with the goniometer and measures the angle to see the passive ROM and the active ROM is measured by the patient himself performing the movement.

**Shoulder internal rotation:**

Patient in supine lying with shoulder and elbow 90\(^\circ\) position. The olecranon process of the ulna is taken as the axis. The movable arm is placed over the midline of the posterior aspect of the forearm and is held in the therapist’s left hand. The stable arm is placed straight line of the moving arm, kept in the air without the patient’s body contact, and is held in the therapist’s right hand. The therapist’s left hand is performing the medial and lateral rotation movement of the shoulder joint with the goniometry and measuring the angle to see the passive ROM and the active ROM is measured by the patient himself performing the movement.

**Shoulder constant score**\(^{22-24}\)

The constant score is a widely used shoulder-specific scoring system which is aimed exclusively at a numerical description of the quality of the shoulder function. From a perfect score of 100, it reserves 35 points for subjective evaluation reported by the patient, including pain and the ability to carry out basic activities of daily living and 65 points for objective measurement. For the latter, 40 points are allocated to ROM and 25 points are allocated to strength. The higher the score, the higher the quality of function.
Data analysis and result

In the present study the effectiveness of Gong’s mobilization on pain and functional ability in patients with periarthritis shoulder. The outcome measures used were NPRS, Goniometer, Constant score. A total of 30 subjects were selected randomly divided into two groups. Group A (n=15) subjects were treated with Gong’s mobilization along with ultrasound therapy, Codman’s pendulum exercise. Group B (n=15) subjects were treated with ultrasound therapy and Codman’s pendulum exercise. The outcome variables were studied by parametric test such as Paired sample “t” test (before and after treatment) and independent sample “t” test (between group comparison) were selected.

The mean of age experimental group was 53.8±12.21 years whereas the mean age of control group was 51.80±9.74 There was no significant difference in the age between groups, with a ‘t’ value of 0.49 and p value of 0.624 which is > 0.05.

Gender distribution shows that 46.7% in experimental group and 53.3% in control group were male and 53.3% in experimental group and 46.7% in control group were females. There was no significant difference in the gender between groups, z value of 0.36 and p value of 0.720 which is >0.05.
Table 1 (i): Comparison of NPRS within groups

<table>
<thead>
<tr>
<th>NPRS</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
<td>PRE</td>
<td>7.47</td>
<td>0.92</td>
</tr>
<tr>
<td>POST</td>
<td>4.60</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Table 2 (ii): Comparison of NPRS Between groups

<table>
<thead>
<tr>
<th>NPRS</th>
<th>Mean difference</th>
<th>Independent sample test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>p</td>
</tr>
<tr>
<td>1.33</td>
<td>4.91</td>
<td>0.001</td>
</tr>
</tbody>
</table>

It is inferred from table 1 that there was significant reduction in the mean NPRS from baseline, M=7.47±0.92 to post treatment in experimental group, M=4.60±1.40, t value of 12.13, and p value of 0.001 which is <0.05. Likewise, there was significant reduction in mean NPRS from 6.33±0.89 in pretreatment to 4.80±0.86 post treatment in control group, t value of 11.50 and p value of 0.001 which is <0.005. Between group comparison shows that there was significantly higher reduction in NPRS in group in experimental group (Mean difference=1.33) than in control group, t value of 4.91 and p value of 0.001 which is <0.05.

Table 3 (i): Comparison of abduction ROM within groups

<table>
<thead>
<tr>
<th>Abduction ROM</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
<td>Pre</td>
<td>99.67</td>
<td>27.87</td>
</tr>
<tr>
<td>Post</td>
<td>133.67</td>
<td>25.10</td>
</tr>
</tbody>
</table>

It is inferred from table 3 (i) that the mean abduction ROM at the start of the study in experimental group was 99.67±27.87 and it was significantly improved to 133.67±25.10 following therapy, t value of 11.42, and p value of 0.001 which is <0.05. similarly, the mean abduction ROM in control group was significantly improved from 115±19.29 at the start of the study to 128.13±18.80 post therapy, t value of 16.10 and p value of 0.001 which is <0.05.

Table 4 (ii) Comparison between medial rotation ROM within groups

<table>
<thead>
<tr>
<th>Medial rotation ROM</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
<td>Pre</td>
<td>51.33</td>
<td>11.57</td>
</tr>
</tbody>
</table>
The mean medial rotation at the start of the study in experimental group and control group was 51.33±11.57 and 50.93±6.68 respectively. It was improved significantly in experimental group and control group post therapy, mean=71±8.06 and 60.13±7.05 respectively (p=0.05).

Figure 5: Shows the comparison of ROM between group

It is inferred from figure 5 shows that, the abduction ROM improvement was significantly higher for experimental group (M=20.87) than control group, t value of 6.76 and p value of 0.001 which is <0.05. Likewise medial rotation improvement was also significantly higher in experimental group than control group, Mean difference =10.47, t value of 5.43 and p value of 0.001 which is <0.05.

Table 5: Comparison of constant score between groups.

<table>
<thead>
<tr>
<th>Constant score</th>
<th>Mean difference</th>
<th>Independent sample test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>t</td>
</tr>
<tr>
<td>12.27</td>
<td>5.12</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Constant score improvement was significantly higher in experimental group (Mean difference=12.27) than in control group, t value of 5.12, p value of 0.001 which is <0.05 (Table 5).
It is inferred from figure 6 shows, the mean constant score at the start of the study in experimental group was 39.97 ± 11.88 and it was significantly improved to 62.09 ± 10.65 after therapy, t value of 10.44, p value of 0.001 which is <0.05.

**Discussion**

The present study was conducted to analyze the effectiveness of gong's mobilization on pain and functional ability in patient with periarthritis shoulder. It was noticed that gong's mobilization technique has showed a highly significant result in subject in periarthritis shoulder. The PA shoulder is painful and disabling disorder of nuclear cause in which the shoulder capsule, the connective tissues surrounding the glenohumeral joint of shoulders become inflamed and stiff, greatly restricting motion and causing chronic pain. Treatment of periarthritis shoulder by means of physiotherapy consists of different broad range of intervention such as electrotherapy, exercise, manual Therapy approaches. Joint mobilization is an effective intervention for breaking up adhesion, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of capsular tissue. In addition, gong's mobilization technique breaks for the adhesion, reduce joint pain, and improve the joint mobility by the restoration of correct physiological tracking.

The study was carried out on 30 patients with two groups of 15 each. Group A (N=15) patients was treated with gong's mobilization with conventional therapy whereas Group B (N=15) was treated only conventional therapy. Outcome measures included pain intensity by NPRS; shoulder ROM by universal goniometry and functional ability by constant score.

After the statistical analysis the mean age of the group A was (53.80±12.21) years whereas the mean age of group B was (51.80±9.74) years. So, the difference in age between groups was statistically insignificant. Among the gender distribution majority of the patient were female (53.3%) in Group A than in Group B.

For NPRS, the mean difference of improvement in group A was comparatively higher than group B. The difference is statically significant (t=12.13, p=0.001). Therefore, the NPRS is significantly higher in group A. Statistically, result of both the group were significant, while clinically the gong's mobilization shows added improvement in pain. The result of this study is
in accordance with previous study of Jyoti Rinker Dilip et al\textsuperscript{19}, the pain may be reduced because Gong’s mobilization has both neurophysiologic and mechanic effect, rhythmic oscillatory movements which stimulate the type -2 dynamic mechanoreceptor and inhibit the type-4 nociceptive receptors and also has an effect on circulatory perfusion, hence effectively used to treat reversible painful joint with low mobility and functionally fixed joint. The mean difference value of NPRS in group A (t=4.91, p=0.001<0.05) was more than in group B (t=11.50, p=0.001) which showed that NPRS was significantly reduced in group A compared to group B.

For ROM, the mean improvement of shoulder abduction and internal rotation of ROM comparatively higher in group A than B and difference is statistically significant (abduction t=11.42, p=0.001, internal rotation t=10.98, p=0.001). according Wontae gong et al\textsuperscript{16}, Gong’s mobilization showed increase in shoulder abduction range of motion occurred because with gong's mobilization, the abduction of the shoulder joint occurs when the humeral head was in normal position and the normal muscular contraction occurs with the rolling and sliding occurs at the articular surface when the tension of posterior joint capsule is reduced. The main advantage of gong's is that it can be done in sitting position, and it provides immediate effect and it doesn't require external rotation to improve abduction. Which can be helpful in frozen shoulder patient where marked limitation of external rotation is present. Hence gong's mobilization can be considered as a useful manual therapy tool in the management of frozen shoulder. Joint mobilization is passive movement applied to the joint surface, so shoulder mechanics under passive conditions need to be considered. The joint glides that accompany glenohumeral motions support the clinical practice of restoring translation movement to restore full physiological motion in shoulder joint, even though care must be taken in attributing joint translation to external mobility glides.

Wontage Gong et al\textsuperscript{16}, carried out a study on effects of Gong’s mobilization applied to shoulder joint on shoulder abduction concluded that gong's mobilization was more effective in increasing ROM. since it is an end range mobilization technique which even maintains shoulder joint in normal position. In a common joint mobilization technique aimed at increasing shoulder medial rotation, anterior to Posterior gliding is performed on subjects who are in the supine position, however anterior to Posterior gliding keeps the humeral head in a normal position in static state, but it doesn't keep the humeral head in a normal position during active movement, therefore gong's mobilization enables shoulder medial rotation with the humeral head in a normal position against the glenoid cavity of scapula, to improve shoulder medial rotation ROM.

For Constant Score, the mean difference of improvement in Group A was comparatively higher than Group B. The difference is statistically significant (t=5.12, p=0.001<0.05). Therefore, reduction of constant score was significantly higher in Group A.
Strength of the study
1. The shoulder constant score used in this study has good reliability and validity.
2. The standard tools were used for statistically analysis

Recommendation and future direction
1. Further study is recommended for measuring the effect on other outcome measurements
2. Study duration could be increased

Limitations
1. The duration of treatment protocol was short days.
2. Limited sample size
3. Only medial rotation, abduction range of motion and pain were measured.
4. Subject with primary PA shoulder in the stage II were considered for the study

Conclusion
The study result concludes that in patients with periarthritis shoulder, the Gong’s mobilization technique is effective in decreasing pain, improving ROM, and functional ability. However, the patients who received the Gong’s mobilization technique showed better improvement than the control group.

References
11. Kumar M, Debnath UK, Goyal M, Kumar D, Chatterjee S. Effect of scapular mobilization in


22. Ilija ban, Andres Trolsen, David Hoyrup, Christiansen Susanne Wulff Svedensen., Standardized test protocol (constant score) for evaluation of functionality in patients with shoulder disorders. Danish medical journal, 2013, vol60 (4) A4608.
