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Gong Mobilization versus Sustained Inferior Capsular Stretch for Adhesive Capsulitis in Managing Pain and Improving Range of Motion in Adhesive Capsulitis: A Randomized Controlled Trial

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Abstract: ***Introduction: Adhesive capsulitis, also known as frozen shoulder, affects 3-5% of the general population and is more common in diabetes patients. A study aims to compare the effectiveness of gong's mobilization versus sustained inferior capsular stretch on pain in adhesive capsulitis. The intervention's efficacy was evaluated using Shoulder Range of Motion, Shoulder Discomfort Disability Index, and Numeric Pain Rating Scale, assessing functional improvement and pain reduction.***
Methodology: The study targeting individuals with adhesive capsulitis and stiffness for at least 3 months with unilateral shoulder pain. Participants were divided into two groups: A and B. The study aimed to evaluate the effectiveness of Gong mobilization versus sustained inferior capsular stretch techniques.
Result And Conclusion: A study compared Gong's Mobilization and sustained inferior Capsular Stretch for pain reduction and increased range of motion in patients with Adhesive capsulitis.
Keywords: Adhesive capsulitis, Gong's Mobilization, Inferior capsular stretch.

I. INTRODUCTION

Adhesive capsulitis, also known as frozen shoulder, is a debilitating condition characterized by progressive shoulder stiffness and pain. It significantly limits daily activities and reduces quality of life. Among the general population, adhesive capsulitis occurs 3–5% of the time; among people with diabetes, the frequency can reach 20%. One of the most prevalent musculoskeletal conditions in orthopaedics. There are two classifications for adhesive capsulitis: primary, which is idiopathic and subtle and secondary, which tends to come on by trauma or subsequent immobilization. Primary adhesive capsulitis patients typically experience relatively gradual beginning and progression of symptoms, without any identifiable precipitating event[1 – 3]. The shoulder joint is an elegant piece of machinery. The glenohumeral joint has three translational and three rotational degrees of freedom, similar to a ball and socket synovial joint. While medial and lateral rotation happen about a long axis parallel to the humeral shaft and passing through the middle of the humeral head, flexion and extension happen around the coronal axis, abduction and adduction happen around an A-P axis. The smaller glenoid fossa and the larger humerus head make up the articulation. Anatomically, the glenohumeral joint capsule is twisted forward and medially, and the humeral head is positioned slightly medially, posteriorly, and superiorly.

Due to the bigger tubercle impinging on the coracoacromial arch, if the humerus is held in neutral or medial rotation, the range of abduction of the humerus in the frontal plane-whether done actively or passively will be reduced[4 – 6]. The most frequent issues are tendinopathy or rotator cuff disease, which can lead to adhesive capsulitis, glenohumeral joint instability, and rotator cuff tears.

Adhesive capsulitis is frequently treated with corticosteroids or anti-inflammatories. NSAIDs can be taken at any stage in an effort to reduce symptoms. Modalities, soft tissue mobilization, manual treatments, therapeutic exercise, and gong mobilization are employed in treatment. By applying an external strain, either manually or mechanically, for approximately 30 seconds, passive stretching is a therapeutic technique intended to lengthen pathologically shortened soft tissue and promote an increase in range of motion.

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Numerous research back up the distinct benefits of cryotherapy, mobilization, ultrasound therapy, and capsular stretching for individuals with frozen shoulders. Centered on a non-invasive mobilization technique that uses an external countertraction device to induce an inferior capsular stretch while including the shoulder's traction component.

Three outcome indicators were used to assess the efficacy of the intervention. Shoulder Range of Motion (ROM): This evaluation, which is done with a goniometer, quantifies the range of motion that is achievable at the shoulder joint. Shoulder discomfort Disability Index (SPDI): The functional limitations and disability resulting from shoulder discomfort during everyday activities are measured using this standardized questionnaire. The Numeric Pain Rating Scale (NPRS) is a patient-reported outcome measure that enables participants to assign a number value to their pain severity (0 being no pain, 10 being the worst suffering possible). Following the intervention, these outcome measures provide a thorough evaluation of the functional improvement in shoulder movement and the pain reduction.

According to Wontae Gong et al., Gong's Mobilization, which is an end range mobilization technique that even keeps shoulder joints in their normal position, is more effective than antero- posterior glides in increasing range of motion (ROM) when applied to the shoulder joint for shoulder medial rotation. Additionally, He found effect of Gong's Mobilization increasing shoulder abduction ROM arid this technique is better than AP glides and that Gong's Mobilization is a useful treatment in clinical setting because of its immediate effects. It involves a therapist-assisted gliding movement of the shoulder joint combined with specific patient movements. Sustained inferior capsular stretch is another manual therapy approach that utilizes a pulley system with weights to gently stretch the tightened shoulder capsule.

While both Gong's Mobilization and sustained inferior capsular stretch are used for adhesive capsulitis, limited research directly compares their effectiveness.

The study's objective is to compare the effects of Gong's mobilization and prolonged inferior capsular stretch on shoulder abduction mobility and pain in adhesive capsulitis. To assess the impact of Gong's Mobilization on participants with adhesive capsulitis by monitoring their shoulder abduction range of motion and pain before and after the intervention. To assess the impact of prolonged inferior capsular stretch in participants with adhesive capsulitis by assessing shoulder abduction range of motion and discomfort before and after intervention. To determine the relative effectiveness of Gong's Mobilization in comparison to persistent inferior capsular stretch by comparing measurements of shoulder range of motion before and after the intervention.

II. MATERIAL AND METHODOLOGY

A. *Method*

This study employed a comparative design to assess the effectiveness of two manual therapy techniques for unilateral shoulder pain. Participants were recruited from outpatient department. The target population included individuals with adhesive capsulitis in unilateral shoulder, experiencing pain and stiffness for at least 3 months. Simple random sampling was used to select 30 participants.

Participants were included in the study if they met the following criteria: were between 45 and 70 years old, of either gender, and had unilateral adhesive capsulitis with a painful stiff shoulder for at least three months. Additionally, they had to have limited active shoulder abduction range of motion, with a maximum of less than 120 degrees, and were referred by an orthopedic physician. On the other hand, participants were excluded from the study if they had a history of surgery on the affected shoulder, suffered from rheumatoid arthritis, had a painful stiff shoulder following severe trauma, had a rotator cuff rupture, or had tendon calcification.

B. *Procedure*

Participants who met the inclusion and exclusion requirements were divided into two groups, A and B, by random. Furthermore, the subject's demographic information was noted. The study comprised two groups: Group A, consisting of 15 subjects who received Gong mobilization, and Group B, comprising 15 patients who underwent Sustained Inferior Capsular Stretch. Both groups continued with their regular conservative management and additional exercises such as Codman's exercise, finger ladder, and wall ladder. Before receiving any kind of treatment, the two groups received five minutes of hot pack therapy. The entire treatment session lasted thirty minutes.

In Group A, the individual sat on a backless stool with their arms out to the sides and their spine straight. The therapist stood on the unaffected side and applied an anterior-to-posterior glide to the humerus and a posterior-to-anterior glide to the scapula, using one hand on the humerus and the other on the scapula. The individual was instructed to perform abduction while maintaining the sustained glide, with their elbow flexed to 90 degrees in the coronal plane and the glenohumeral joint medially rotated. This exercise was repeated for two sets of 15 repetitions each, with a 5-minute break in between sets.

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In Group B, the patient sat comfortably upright in a chair with a backrest, using a shoulder counter traction apparatus consisting of two overhead pulleys on a wall-fixed L-shaped steel frame. A free weight of 2-3 kg was attached to one end of the rope passing through the pulleys, with the other end connected to the distal end of the affected upper limb, covered with a medium-sized bandage and cuff, using an S hook to join the rope's ends. The patient was seated erect in the chair, directly beneath the pulleys, and weight was added based on a 60 kg body weight cut-off.

III. DATA ANALYSIS AND INTERPRETATION

Table:-1 Represents the mean difference and standard deviation of the pre-test and post-test values of pain intensity measured using the Numerical Pain Rating Scale (NPRS).

	GROUP A	GROUP B
MEAN DIFFERANCE	2.15	1.10
STANDARD DEVIATION	1.09	0.72

Table:-2 Represents the mean difference and standard deviation of the pre-test and post-test values of the Shoulder Pain and Disability Index (SPADI).

	GROUP A	GROUP B
MEAN DIFFERANCE	20.75	15.32
STANDARD DEVIATION	5.37	5.79

Paired T-test was used to test the significant difference in Shoulder Pain and Disability Index (SPADI) scores of pre and post test. Group A (Gongs Mobilization) consisted of 15 patients, with a standard deviation of 5.37 and a mean difference of 20.75. Group B (Sustained Inferior Capsular Stretch) consisted of 15 patients, with a standard deviation of 5.79 and a mean difference of 15.32.

IV. RESULT

Group A (Gongs Mobilization) showed a mean difference of 20.75, while Group B (Sustained Inferior Capsular Stretch) showed a mean difference of 15.32. Statistically significant differences were observed in pre- and post-treatment effect comparisons of all outcome measures ($P > 0.01$), indicating that both interventions were effective in improving shoulder pain and disability. However, Group A (Gongs Mobilization) demonstrated greater improvement compared to Group B (Sustained Inferior Capsular Stretch).

V. DISSCUSSION

This study compared the effectiveness of Gong's Mobilization and sustained inferior capsular stretch in reducing pain and improving function in individuals with adhesive capsulitis. Both interventions resulted in improvements in shoulder range of motion and pain reduction, as measured by goniometry, Shoulder Pain Disability Index (SPDI), and Numeric Pain Rating Scale (NPRS).

Our findings align with previous research supporting the effectiveness of Gong's Mobilization for adhesive capsulitis. Studies by Wontae Gong et al. (2012) and Hyunmin Lee et al. (2011) demonstrated significant improvements in shoulder ROM after Gong's Mobilization. Similarly, Sunil G. Harsulkar et al. (2013) reported successful application of Gong's Mobilization in a case study with adhesive capsulitis. The end-range mobilization technique employed in Gong's Mobilization may contribute to its effectiveness, as suggested by Mehta Bryna Pankaj et al. (2013).

Joint mobilization is a manual therapy used to preserve free movement of joints or return them to their normal state. It involves applying passive traction and gliding motion on the articular surface. Joint mobilization is an excellent way to increase joint mobility and relieve discomfort. Studies have shown that patients who receive manual therapy, such as mobilization, experience far better results. It has an initial hypoalgesic and sympathoexcitatory impact that is treatment-specific and greater than that of a placebo or control. The subjects were distracted as their shoulders were abducted. The humeral head must roll and slide in unison during shoulder abduction. The humeral head Is frequently medially twisted and dragged forward during typical rolling and sliding, though, because of excessive tension in the pectorals' major and subscapularis muscles. An aberrant posture exists between the glenoid cavity and humeral head due of an increase in the posterior joint capsule's tension. For the reasons listed above, gongs mobilization is utilized to maintain the humeral head in its natural position within the glenoid cavity of the scapula, hence increasing rolling and sliding of the shoulder joint.

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Additionally, by generating rheologic changes in synovial fluid, improving interaction between synovial fluid and cartilage matrix, and increasing synovial fluid, mobilization treatments are intended to improve or preserve joint mobility. Joint mobilization procedures have a number of positive outcomes. Peripheral mechanoreceptor activation and nociceptors' inhibition underpin the neurophysiologic impact. When forces are applied toward resistance within a subject's tolerance limits, the biomechanical effect is evident. Mechanical alterations resulting from specific movements that stress certain regions of the capsular tissue may include collagen realignment, adhesion dissolution, or increased fiber glide. Owing to the source of positional errors, modifications to the articular surfaces' form, cartilage thickness, ligament and capsule fiber orientation, or the pull and direction of muscles and tendons

Comparing the means of the constant shoulder function score in Gong's group from pre to post intervention, there is a statistically significant shift, according to the study of pain and shoulder mobility within the group. Increased range of motion in the abduction of the shoulder joint resulted from Gong's mobilization, which causes normal muscular contraction, rolling and sliding at the articular surface, and abduction of the shoulder joint when the posterior joint capsule is less taut. The main advantage of Gong's Mobilization is that it can be done in sitting position, and it provides immediate effect and it does not require external rotation to improve abduction which can be helpful in frozen shoulder patient where marked limitation of external rotation is present. Gongs mobilization is effective in both the sitting and side lying positions.

Patients with adhesive capsulitis had worse outcomes from aggressive stretching that went beyond their pain threshold, especially if the stretching was done early in the syndrome. At stage three, the fibrotic connective tissue wall is reached as the discomfort and synovitis/angiogenesis decrease. The main way that tissue stress is advanced is by increasing the frequency and length of stretches while maintaining an acceptable level of intensity. It is possible to request that the patient hold the stretch for extended durations of time and participate in more sessions daily. When conducting exercises, the patient is advised to prevent carryover of aberrant movement patterns when motion returns by avoiding excessive scapular compensating. In order to affect tissue remodeling, more rigorous stretching and LLPS utilizing a pulley or device are applied when the patient's imitability level drops. The term "tissue remodeling" describes a physical rearrangement of the connective tissue extracellular matrix (fibers, crosslinks, and ground substance). Collagenous tissues respond to increased tensile loading by increasing the synthesis of collagen and other extracellular components.

Tensile strength is enhanced when collagen is orientated parallel to the lines of stress. It is significant to remember that, in contrast to mechanically driven change, which happens in a matter of minutes, biologic remodeling takes place over extended periods of time (months). 87 Brand24 refers to this event as the contracted tissue's "growth," not its stretch. This process of growth aligns with the healing process observed in cases of primary frozen shoulder. LLPS can be produced by commercially available devices like the Dynasplint and continuous passive motion units; however, these devices need to be positioned precisely and have a set amount of time during the day.

Techniques for joint mobilization are thought to have a number of positive outcomes. Peripheral mechanoreceptor activation and nociceptors' inhibition underpin the neurophysiologic impact. When forces are applied toward resistance while staying within a subject's tolerance limits, the biomechanical effect becomes apparent. When particular movements stress particular sections of the capsular tissue, the mechanical alterations may include collagen realignment, adhesion breakup, or increased fiber glide. It worked well to increase range and lessen pain. Tensile strength is enhanced when collagen is stretched because it is aligned parallel to the lines of stress. It is crucial to remember that biologic remodelling takes place gradually. While it was not very successful in increasing range of motion and reducing pain.

While both interventions showed positive outcomes, further analysis is needed to determine if one technique has a statistically significant advantage over the other. Future studies with larger sample sizes and longer follow-up periods could provide more conclusive evidence. The sample size was relatively small, and the study design did not include blinding of therapists or participants. Additionally, the study only assessed outcomes in the short term. Long-term follow-up data would be valuable to determine the lasting effects of each intervention.

Future research could explore the specific mechanisms by which Gong's Mobilization and sustained inferior capsular stretch work to improve shoulder function in adhesive capsulitis. Additionally, studies comparing these techniques with other commonly used interventions for adhesive capsulitis could help guide treatment decisions for therapist.

This study suggests that both Gong's Mobilization and sustained inferior capsular stretch are effective for reducing pain and improving shoulder function in individuals with adhesive capsulitis. Further research is needed to determine if one technique is superior and to explore the underlying mechanisms of action.

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A. Ethics Approval
Approval was obtained from local ethics committee.

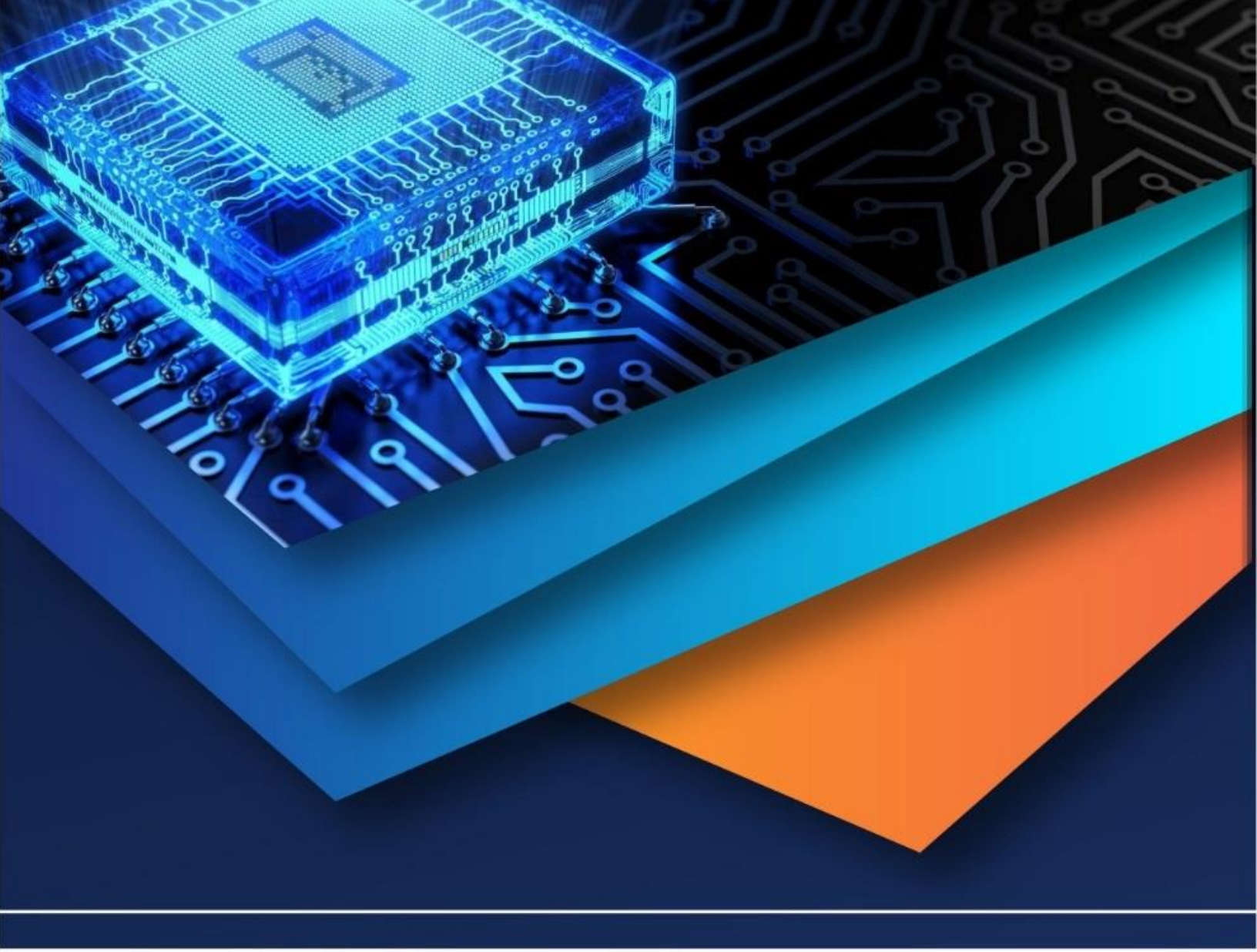
B. Acknowledgements
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C. Fundings
The research received no external fundings

D. Conflict Of Interest
No conflict of interest.

VI. CONCLUSION
This study demonstrated that both Gongs Mobilization and Sustained Inferior Capsular Stretch are effective in reducing pain and improving range of motion in patients with adhesive capsulitis, but Gongs Mobilization shows enhanced effectiveness in achieving significantly greater pain reduction and range of motion improvement, suggesting its potential as a preferred treatment option for adhesive capsulitis.

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