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HEALTH AND REHABILITATION

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EFFECT OF GONGS MOBILIZATION WITH NEUROMUSCULAR ELECTRICAL STIMULATION VS CONSERVATIVE EXCERCISES AMONG ADHESIVE CAPSULITIS

Original Research

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Acknowledgement: The authors acknowledge the support of Gosha-e-Shifa Hospital for data collection and clinical guidance.

Conflict of Interest: None
Grant Support & Financial Support: None

ABSTRACT

Background: Adhesive capsulitis, also known as frozen shoulder, is a self-limiting yet functionally disabling condition marked by progressive pain and reduced gleno-humeral joint mobility. It severely compromises daily function and quality of life. Conservative interventions such as physiotherapy and electrotherapy are commonly used to manage symptoms. However, combining manual therapy with neuromuscular stimulation may yield superior outcomes in pain relief and functional restoration.

Objective: To compare the effectiveness of Gong's mobilization combined with neuromuscular electrical stimulation (NMES) versus conservative exercise therapy in reducing pain and improving functional mobility in patients with adhesive capsulitis.

Methods: A randomized controlled trial was conducted over six weeks at Gosha-e-Shifa Hospital, involving 36 participants aged 41–60 years diagnosed with stage II or III adhesive capsulitis. Participants were allocated into two groups: the experimental group received Gong's mobilization with NMES, while the control group received conservative physiotherapy including TENS, hot/cold packs, ultrasound, and range of motion exercises. Pain intensity and shoulder disability were evaluated using the Visual Analogue Scale (VAS) and Shoulder Pain and Disability Index (SPADI), while range of motion (ROM) was measured using a goniometer. Statistical analysis was performed using SPSS-23 with paired and independent t-tests.

Results: The Gong's mobilization with NMES group showed a mean post-treatment VAS score of 2.48 (mean difference = 0.853) and SPADI score of 20.89 (mean difference = 11.33). Post-intervention ROM improved significantly with flexion 164.28±11.2°, extension 45.28±4.7°, abduction 164.28±11.2°, internal rotation 72.67±5.2°, and external rotation 78.06±8.6°. The conservative group also showed improvement, but to a lesser extent: VAS 5.05 (mean difference = 2.572), SPADI 42.89 (mean difference = -22.0), and post-ROM flexion 131.50±15.7°, extension 39.22±3.62°, abduction 131.5±15.7°, internal rotation 59.56±3.82°, and external rotation 66.72±13.4°.

Conclusion: Both interventions were effective; however, Gong's mobilization with NMES demonstrated superior improvements in pain reduction, shoulder mobility, and functional outcomes.

Keywords: Adhesive Capsulitis, Exercises, Gong's Mobilization, Neuromuscular Electrical Stimulation, Physical Therapy Modalities, Range of Motion, Shoulder Joint.

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COMPARING GONG'S MOBILIZATION WITH NMES IN ADHESIVE CAPSULITIS

INTRODUCTION

Adhesive capsulitis, or frozen shoulder, is characterized by pain and restricted shoulder movement

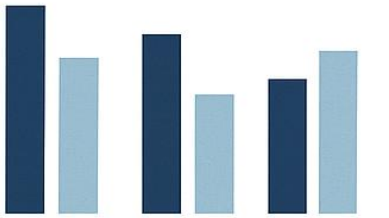
METHODS

Gong's Mobilization + NMES

VS

Conservative Exercise

RESULTS



CONCLUSION

Gong's mobilization with NMES was more effective at reducing pain and improving shoulder function

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INTRODUCTION

Adhesive capsulitis (AC), more commonly known as frozen shoulder, is a painful and progressively disabling musculoskeletal condition characterized by a significant restriction in the range of motion of the glenohumeral joint. It typically manifests insidiously without any obvious trauma and is marked by a classical capsular pattern of movement restriction—most notably external rotation, followed by abduction in the scapular plane and forward flexion (1). Though historically reported to affect around 2% of the general population, some studies suggest the actual prevalence may be as low as 0.75%, indicating the need for refined epidemiological data (2). AC is more prevalent in females, particularly those around the age of 56, and its etiology remains largely idiopathic despite several well-documented risk factors. These include metabolic and endocrine disturbances such as diabetes mellitus and thyroid dysfunction, as well as hypertension, dyslipidemia, prior trauma, and increasing age (3). Despite its self-limiting nature, the prolonged course and functional impairment associated with AC often necessitate targeted interventions aimed at pain relief and restoration of mobility. Traditional conservative treatments include physiotherapeutic techniques such as manual mobilizations, stretching exercises, and thermal modalities (4,5). However, recent interest has emerged in adjunctive strategies like neuromuscular electrical stimulation (NMES) and Gong mobilization, each offering distinct physiological benefits. Gong mobilization harnesses the therapeutic properties of low-frequency sound vibrations to enhance relaxation, modulate pain, and facilitate joint movement, while NMES involves the application of controlled electrical impulses to induce muscle contractions, thereby promoting muscle strength and reducing atrophy (6,7). The rationale for combining Gong mobilization with NMES lies in the potential for synergistic effects—while one modality targets joint mobility and sensory modulation, the other reinforces muscular activation and endurance. Preliminary findings suggest that such integrated approaches may offer superior outcomes compared to conventional physical therapy alone (8). However, robust clinical evidence remains limited, and standardized treatment protocols are yet to be established. Therefore, the objective of the present study is to evaluate and compare the efficacy of Gong's mobilization combined with neuromuscular electrical stimulation versus standard conservative physiotherapy in managing patients with adhesive capsulitis, aiming to inform future rehabilitation strategies and improve patient-centered outcomes (9).

METHODS

This single-blinded randomized controlled trial (RCT) was conducted over a period of ten months to evaluate the comparative effectiveness of Gong's mobilization combined with neuromuscular electrical stimulation (NMES) versus conservative physical therapy in patients with adhesive capsulitis. A total of 36 participants were enrolled, with an estimated dropout rate of 10%, adjusting the required sample size to 40 (2). Participants were selected using a non-probability convenience sampling technique. The study site was Gosha-e-Shifa Hospital in Lahore, where data collection and intervention delivery took place. Ethical approval for the study was obtained from the institutional review board, and written informed consent was secured from all participants prior to enrollment, in accordance with the Declaration of Helsinki. Eligible participants included adults aged 41 to 60 years, of either gender, clinically diagnosed with frozen shoulder (adhesive capsulitis) and confirmed by an orthopedic consultant (3). Only those in stage II or III of the condition were included (4). Another criterion for inclusion was a minimum 25% loss in the range of motion compared to the unaffected shoulder (6). Exclusion criteria comprised patients with rotator cuff tears (7), overuse injuries (4), history of rheumatoid arthritis, osteoarthritis, or malignancy affecting the shoulder (8), adhesive capsulitis secondary to neurological conditions (9), unstable shoulders or recurrent dislocations (3), and post-surgical cases involving the shoulder joint (1).

Participants were randomized into two groups. Group A received Gong's mobilization combined with NMES. During each session, the therapist applied an antero-posterior glide to the humeral head while stabilizing the scapula. Participants performed rapid and forceful shoulder abduction in the coronal plane without external rotation or elbow flexion. At the terminal range of available movement, Maitland Grade III-IV oscillatory mobilizations were performed for 30 seconds. This complete mobilization cycle was repeated 10–15 times per session with 30-second rest intervals between repetitions (10). Following the mobilization, NMES was applied for 15 minutes using a device programmed to deliver a symmetrical biphasic waveform with a frequency of 35–50 Hz and a pulse width of 250–300 µs. The duty cycle was set at a 1:3 ratio (5 seconds on, 15 seconds off) to prevent muscle fatigue (9). Group B participants received comprehensive conservative physiotherapy. A hot or cold pack was applied to the affected shoulder for 10–15 minutes, based on individual preference and clinical judgment (11). Transcutaneous electrical nerve stimulation (TENS) was administered using a conventional mode with a frequency of 80–120 Hz and a pulse width of 50–100 µs (12). Ultrasound therapy in continuous mode was applied to the anterior, posterior, and lateral aspects of the shoulder at an intensity of 1.5 W/cm² for 8 minutes (13). Therapeutic exercises

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included shoulder wheel movements (three sets of 10 repetitions), finger ladder climbing (three sets with brief rest intervals), and Codman's pendular exercises performed for three minutes per session (14).

RESULTS

A total of 36 participants were included in the study, comprising 16 males (44.4%) and 20 females (55.6%). The mean age of participants was 51.86 ± 4.923 years, with a mean weight of 91.0 ± 15.275 kg, mean height of 5.073 ± 0.6571 feet, and mean body mass index (BMI) of 40.106 ± 10.55. The side of shoulder involvement showed a predominance of left-sided cases (n=24) compared to right-sided (n=12). Participants were divided equally into two groups: the experimental group received Gong's mobilization with neuromuscular electrical stimulation, while the control group underwent conservative physiotherapy interventions. Statistically significant differences were observed within and between groups across all outcome measures. In the experimental group, the mean Visual Analog Scale (VAS) score decreased from 7.86 ± 1.149 to 2.48 ± 1.422, while in the control group, it decreased from 7.01 ± 1.270 to 5.05 ± 1.376 ($p < 0.05$), indicating greater pain reduction in the experimental group. Similarly, the mean Shoulder Pain and Disability Index (SPADI) score dropped from 78.06 ± 8.660 to 20.89 ± 5.603 in the experimental group, and from 66.72 ± 13.477 to 42.89 ± 8.519 in the control group, again favoring the experimental intervention ($p < 0.001$). Improvements in shoulder joint range of motion were also more pronounced in the experimental group. Shoulder flexion improved from 69.39 ± 6.344 to 164.28 ± 11.250 degrees in the experimental group compared to 61.67 ± 6.389 to 131.50 ± 15.749 degrees in the control group ($p < 0.001$). Shoulder extension improved from 29.50 ± 3.130 to 45.28 ± 4.738 degrees in the experimental group and from 32.94 ± 4.964 to 39.22 ± 3.623 degrees in the control group ($p < 0.001$). For shoulder abduction, the experimental group improved from 67.83 ± 8.528 to 164.28 ± 11.250 degrees, and the control group from 60.00 ± 7.837 to 131.50 ± 15.749 degrees ($p < 0.001$).

Internal rotation improved from 36.56 ± 15.782 to 72.67 ± 5.202 degrees in the experimental group, and from 49.78 ± 8.085 to 59.56 ± 3.823 degrees in the control group ($p < 0.001$). External rotation increased from 51.50 ± 6.392 to 78.06 ± 8.660 degrees in the experimental group and from 38.28 ± 5.039 to 66.72 ± 13.477 degrees in the control group ($p < 0.005$), demonstrating a notable improvement in joint flexibility and overall shoulder function in the experimental group. Based on the between-group post-treatment comparisons, the experimental group (Gong's mobilization with NMES) demonstrated consistently superior outcomes across all measured parameters when compared to the control group (conservative exercises). Post-treatment Visual Analog Scale (VAS) scores were significantly lower in the experimental group (2.48) than in the control group (5.05), with a mean difference of -2.57, indicating greater pain relief. Similarly, the Shoulder Pain and Disability Index (SPADI) showed a more substantial improvement in the experimental group (20.89) compared to the control group (42.89), with a between-group difference of -22.00. Regarding shoulder joint range of motion, the experimental group outperformed the control group with mean differences of 32.78° in both flexion and abduction, 6.06° in extension, 13.11° in internal rotation, and 11.34° in external rotation. All differences were statistically significant ($p < 0.005$), suggesting that the combined intervention yielded more substantial functional gains.

Table 1: Between-Group Comparison of Pre- and Post-Treatment Outcomes in VAS, SPADI, and Shoulder Range of Motion

GROUPS		Mean Difference	Mean	Std. Deviation	P-Value
PRE_VAS	A	.853	7.86	1.149	.042
	B		7.01	1.270	
POST_VAS	A	-2.572	2.48	1.422	.000
	B		5.05	1.376	
PRE_SPADI	A	11.333	78.06	8.660	.005
	B		66.72	13.477	
POST_SPADI	A	-22.000	20.89	5.603	.000
	B		42.89	8.519	
PRE_FLEXION	A	7.722	69.39	6.344	.001
	B		61.67	6.389	
POST_FLEXION	A	32.778	164.28	11.250	.000
	B		131.50	15.749	
PRE_EXTENSION	A	-3.444	29.50	3.130	.018

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GROUPS		Mean Difference	Mean	Std. Deviation	P-Value
	B		32.94	4.964	
POST_EXTENSION	A	6.056	45.28	4.738	.000
	B		39.22	3.623	
PRE_ABDUCTION	A	7.833	67.83	8.528	.007
	B		60.00	7.837	
POST_ABDUCTION	A	32.778	164.28	11.250	.000
	B		131.50	15.749	
PRE_INTERNAL_ROTATION	A	-13.222	36.56	15.782	.003
	B		49.78	8.085	
POST_INTERNAL_ROTATION	A	13.111	72.67	5.202	.000
	B		59.56	3.823	
PRE_EXTERNAL_ROTATION	A	13.222	51.50	6.392	.000
	B		38.28	5.039	
POST_EXTERNAL_ROTATION	A	11.333	78.06	8.660	.005
	B		66.72	13.477	

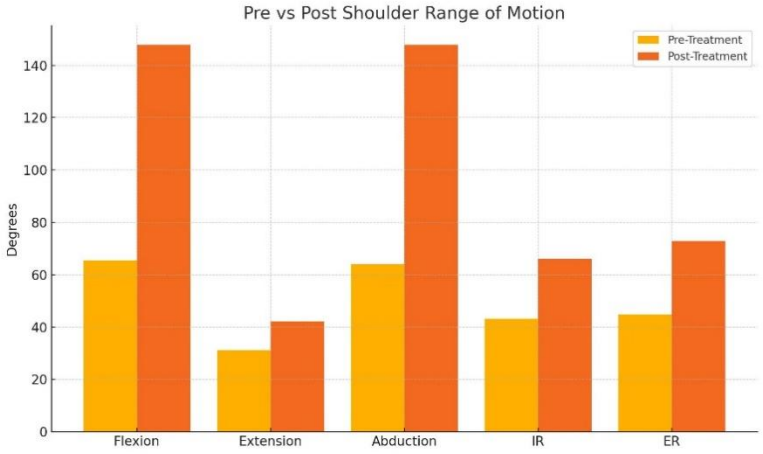

Figure 1 Pre vs Post Shoulder Range of Motion

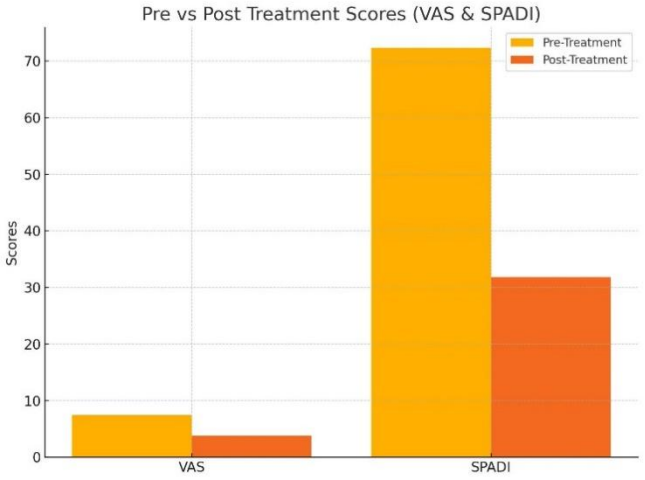

Figure 2 Pre vs Post Treatment Scores (VAS & SPDI)

DISCUSSION

The present study was designed to compare the effectiveness of Gong's mobilization combined with neuromuscular electrical stimulation (NMES) versus conventional conservative therapy in the management of adhesive capsulitis, with a specific focus on reducing pain, enhancing functional ability, and restoring shoulder joint range of motion. The outcomes were measured using validated clinical tools, including the Visual Analog Scale (VAS), the Shoulder Pain and Disability Index (SPADI), and standardized goniometric measurements of shoulder joint mobility. The findings demonstrated statistically significant improvements across all parameters in the group receiving Gong's mobilization with NMES, with p-values less than 0.05 indicating meaningful clinical change. Pain intensity, as measured by the VAS, showed a substantial reduction from baseline to post-intervention in the experimental group, aligning with previous evidence that supports the analgesic effects of Gong's mobilization techniques when coupled with neuromuscular stimulation. Similarly, a notable decline in SPADI scores post-treatment reflects enhanced shoulder function and reduced disability (15,16). Improvements in joint mobility—especially in shoulder flexion, abduction, and both internal and external rotation—were significantly greater in the experimental group compared to the control, reinforcing the therapeutic synergy of mobilization and NMES in promoting musculoskeletal recovery (17,18). These findings are consistent with earlier clinical trials that reported accelerated improvements in internal rotation mobility and faster pain relief in patients treated with Gong's mobilization, alongside increased muscular recruitment

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and functional gains over shorter durations of therapy (19,20). Other comparative trials also noted superior shoulder mobility and functional recovery scores in groups managed with Gong's mobilization as opposed to exercise therapy alone, suggesting a replicable advantage of this approach across various patient populations with adhesive capsulitis (21,22).

The strengths of this study lie in its randomized controlled design, the use of objective and clinically relevant outcome measures, and the implementation of a multimodal intervention that reflects real-world clinical practice. The inclusion of a sufficient sample size and a structured protocol further supports the internal validity of the results. However, certain limitations must be acknowledged. The use of convenience sampling may limit the generalizability of the findings. The absence of long-term follow-up restricts conclusions regarding sustained benefits, and the single-center setting may introduce potential site-related biases. Moreover, no subgroup analyses were performed to explore gender-based or side-specific variations in treatment response, which could offer additional clinical insight. Future research should focus on multicenter trials with larger, more diverse populations to enhance external validity. Longitudinal designs incorporating follow-up assessments are warranted to evaluate the durability of therapeutic effects. Additionally, investigating the neurophysiological mechanisms underlying Gong's mobilization and its interaction with NMES could deepen understanding of its efficacy. Integrating patient-reported outcome measures and cost-effectiveness analyses would also contribute to comprehensive clinical decision-making. Overall, this study contributes valuable evidence to the growing body of literature advocating for integrated manual and electrotherapeutic interventions in adhesive capsulitis, highlighting their potential to significantly enhance pain relief, function, and joint mobility when compared to conventional conservative methods.

CONCLUSION

This study concludes that while both conservative exercise and the combination of Gong's mobilization with neuromuscular electrical stimulation contributed to meaningful improvements in patients with adhesive capsulitis, the integrated approach proved to be more effective in reducing pain, enhancing functional ability, and restoring shoulder mobility. These findings support the incorporation of multimodal therapies in physiotherapy practice, offering a more comprehensive strategy for optimizing recovery and improving quality of life in individuals affected by frozen shoulder.

AUTHOR CONTRIBUTION

Author	Contribution
Zinnia Akram*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Gulnaz Zaheer	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Anam Hanif	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Nazar Deen	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Abdul Rehman	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Fatima Liaquat	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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