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Comparison of Effectiveness of Maitland's Mobilizations at End-Range Versus Within Pain-Free Joint Range of Movement in Treatment of Patients with Frozen Shoulder RCT

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ABSTRACT: *Maitland's mobilizations are an important treatment option for treating patients with Frozen shoulder or Adhesive capsulitis of shoulder joint. In this study we compared the efficacy of Maitland's mobilization at end-range of tissue resistance with high intensity glides i.e. High Grade with low intensity glides i.e. Low grade within pain free range of joint movement. The study was conducted at OPD of Department of Physical Therapy, Mayo Hospital, Lahore. In this study total of 57 patients were taken and only 36 patients were selected after assessing on inclusion criteria. Those 36 patients were divided into 3 groups with 12 patients in individual group. With the joint close to its neutral position, translation and distraction techniques were used to begin mobilization techniques in the fundamental starting positions. Numeric Pain Rating Scale (NPRS) and SPADI scales were used for measuring pain and disability index. ROMs were measured before, during and after treatment course i.e. at Day 1, after 2 weeks and after 4 weeks respectively. Statistical analysis was done on SPSS using ANOVA. When the ranges were compared by using ANOVA on SPSS it was evident that Group A patients showed better treatment outcomes as compared to other two groups. P-value (0.000) less than 0.05 is considered significant for group A patient.*

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Mean of demographic data also support the fact that AC is more common in women than man. As a result of this study we can conclude that all treatment options gave good results in enhancing range of motion (ROM) and decreasing pain in shoulder joint but high-grade mobilization techniques applied at end range gave a significant treatment outcome on Ranges when compared. Numeric Pain Rating Scale (NPRS) and SPADI scales

KEYWORDS: effectiveness of Maitland's mobilizations, end-range, pain-free joint range of movement, treatment, patients with Frozen shoulder RCT

INTRODUCTION

Shoulder joint with Adhesive capsulitis AC is frequently described as a condition accompanied by escalating discomfort and a partial or complete loss of both active and passive shoulder girdle motion. Frozen shoulder or AC is described as severe pain in shoulder joint due to stiffness of soft tissue wrapping the shoulder joint and progressive loss of function due to limited ROMs of all muscles and soft tissue.. [1] Painful shoulder joint substantially compromise upper limb mobility and functional abilities, and may disturb sleep due to discomfort. It may also affect social wellbeing and psychological health. Subacromial joint pathology is the root of 70% of shoulder problems. [2] The majority of people affected are between the ages of 40 and 60, with incidence rates between 3% to 5% annually and reaching 40% among those who have diabetes. [4, 5] AC is common is both types of Diabetes but it depend on age of patient and duration of Diabetes However, gender is also an important factor because AC affect women more than men. [6] Statistics shows that 2% or more of general population is affected with Frozen shoulder, majority of which are women. [7] Those having Type 1 Diabetes with poor control of glucose are known to have worsen pain in shoulder region [8] There are two types of AC known to us. These include Primary or idiopathic AC, the reason of which is still unknown and there is no other pathology. Secondary or Acquired AC is linked with other pathologies and co-morbidities. [3] Secondary AC has various causes that are directly or indirectly dependent on other pathologies. Major causes may include any recent surgical intervention, long term immobilization in bed-ridden such as in hemiplagia, RTAs, casting in POP as a result of fracture of elbow as well as chronic or systemic, illnesses, however the exact reason of primary AC is still questionable. A long standing history of Diabetes is also linked with AC. [9] Recently the prevalence of AC has been increased tremendously in all across the world due to different factors that has diverted the attention of patients towards Physical

therapy (PT) interventions that are more useful and long lasting treatment options instead of pain killers and operative procedures.. [10]

Understanding the anatomy of the shoulder bone, as well as precise and accurate ways to measure pain and functional limitations with subsequent disability, are crucial for determining the efficacy of particular treatments and creating successful management plans. Different physical therapy techniques are available to treat AC patients, however high-quality researches supported the role of joint movement in easing pain and enhancing shoulder joint mobility in these patients. [10]

Kaltenborn suggested different grades of mobilisations, such as mid-range and end-range mobilisations, to increase joint mobility and decrease pain. According to Yang et al. [11], in AC patients, Mulligan mobilisation with movement (MWM) and Kaltenborn mobilisation (KM) are more helpful than Maitland mobilisation (MM). [12] According to Vermeulen HM et al. [13], KM (end-range) was more successful at enhancing glenohumeral mobility in AC patients. The management of AC may benefit from the use of steroid medication, thermotherapy, and manual mobilisation techniques, according to a number of researchers. According to Bal et al. [14], thermotherapy used before and after shoulder workouts increased glenohumeral mobility in AC patients more successfully. The shoulder is made up of the humerus, glenoid, scapula, acromion, clavicle, and nearby soft tissues. The sternoclavicular joint, acromioclavicular joint, and glenohumeral joint are the three major articulations. The most frequently displaced major joint in the body is the glenohumeral joint. The stability of the shoulder joint is because of surrounding musculature, especially the rotator cuff muscles, and ligaments. The supraspinatus, infraspinatus, teres minor, and subscapularis muscles work together as a single unit to form the rotator cuff. Importantly, these muscles depress the humeral head on the glenoid as the arm is raised in addition to aiding in internal and external rotation of the shoulder. The tendons come together to form the rotator cuff tendon, which is one tendon. In the subacromial space, this passes. The area between the acromion and the rotator cuff tendons is filled by the subacromial bursa, which has many pain sensors.. Adhesive Capsulitis (AC) was categorised by Wong et al. as idiopathic (primary) or following shoulder surgery or trauma (secondary). Tradition dictates that the damaged shoulder will ultimately get better or "thaw out" independent of therapeutic intervention. This long-held belief that frozen shoulder will completely resolve on its own without therapy is false. Understanding the aetiology of frozen shoulder would, in most circumstances, enhance treatment results and lessen pain and suffering brought on by the condition. The global loss of shoulder range of motion and

nocturnal pain have frequently been suggested as diagnostic criteria for AC by various doctors in the past. [15] However, due to the paucity of knowledge regarding the initial 3-6 months of this condition, these clinical criteria were not determined to be reliable diagnostic indicators of AC Hence the diagnosis of AC is still debatable. The dearth of knowledge about early AC raises the possibility that prompt therapy may be required to prevent long-term functional impairments and disability. Furthermore, while addressing potential pathological reasons for frozen shoulder, reliance on low-level evidence may have contributed to more confusion. Duplay coined the term "scapulohumeral peri-arthritis" to characterise the painful and stiff shoulders caused by trauma that later became inflamed and formed fibrous adhesion bands. [16]The outcomes we get from supervised neglect method are better than any other technique such as stretching or passive mobilization. Additionally, diabetic individuals were not included in Diercks et al.'s[17] investigation due to worries that the condition behaved differently in this group subset. Therefore, diabetic individuals might not be candidates for the supervised-neglect strategy. Patients either with or without diabetes who had AC were monitored for 10 years by Vastama ki et al. [18]. Although shoulder range of motion (ROM) increased over time in diabetes patients, it remained below normal ROM and was lower to that of those without diabetes. Additionally, several research have demonstrated that people with diabetes experience reduced range of motion (ROM), functional impairment, and chronic shoulder stiffness. These studies suggested that early shoulder evaluation and therapy were necessary to lessen disability and enhance quality of life for diabetic individuals. Wong et al research[16] .'s shown that appropriate evidence supports early treatment to minimise pain and enhance ROM. Several systematic reviews have investigated the efficacy of various AC therapy modalities in general populations, i.e., not just diabetics While some physical therapy techniques, like exercises and joint mobilisation, have been demonstrated to both temporarily and permanently relieve pain and regain shoulder range of motion and function.[19] Surgical release of capsule and Manipulation under anaesthesia (MUA) are proved beneficial for increasing ROM and decreasing pain index but reliability in these outcomes is disputed due to subpar methodological standards..[20] Few evidence suggested that steroid injections had negligible short-term pain-relieving effects., For acupuncture's efficacy on discomfort and range of motion, there is just scant to moderate data. A recent randomised controlled trial (RCT) also revealed that acupuncture helped individuals with adhesive capsulitis by reducing discomfort and restoring shoulder function. In 1934 a series of pathologies of structures lying within shoulder joint and inflammation of bursa, Codman used the term Frozen Shoulder

for first time to all the degenerative changes of rotator cuff muscles and the adhesions within shoulder. According to him, all these changes may re absorb eventually with time. [16, 22] After surgically eliminating capsular contractures to reestablish flexibility in 10 % of patients of limited joint movement caused by minute capsular degradation, Neviaser used the term "adhesive capsulitis" in 1945. [23] Results from different researches shows that hyperplasia caused due to over use or other pathology cause capsular fibrosis of shoulder capsule that will restrict movement of joint and cause stiffness. This stiffness of joint is clinically proven and named as AC. [24] Thickening of capsule of shoulder joint is main cause of restriction in ROM of shoulder that may not be related joint adhesions.[26] Reeves claimed in the 1970s that AC is characterized by three phases. First it causes painful shoulder joint, in second phase stiffness progresses and all functional abilities are restricted. Third phase is recovery phase which reverses all the negative changesr Neviaser's 1953 [25] partial rotator cuff tear and 1945 adhesive capsulitis articles. Grey developed the notion, proposing that frozen shoulder was a self-limiting syndrome that entirely cured over time [27] The self-limiting natural history theory may be applicable to partial cuff tears, but it has lesser chance of being accurate when it comes to the fibrous adhesions and thickening of the joint capsule observed in frozen shoulders. Given the persistent and unresolved deficiencies previously recorded, even within Reeves' study, the natural history idea that frozen shoulders go from stiff to healing stages, leading to complete recovery without therapy was already debatable. The belief that frozen shoulder is a self-limiting illness that gets better with time has been around for a while, but evidence of long-term residual deficiencies years later [29], review articles [30], orthopaedic texts, and online health websites all continue to support it. The widespread belief that a self-limiting resolution will occur can have an impact on clinicians' and patients' clinical decisions. Patients and practitioners may decide against seeking treatment rather than bear the expense, discomfort, and inconvenience of doing so, only to later develop chronic residual deficits that can limit their ability to function. [31] Current evidence-based recommendations and clinical practise guidelines for the treatment of patients with AC were published by Kelley et al. [32]. The therapies included joint mobilisations, translational mobilisations, manipulations, short-term corticosteroid injections, knowledge of patient about disease, physical therapy modalities including ultrasound and electrical stimulation, and stretching exercises. They came to the conclusion that some physiotherapeutic procedures provide evidence of both short- and long-term pain reduction or mobility improvement.. Shin et al. [33] utilised the Chuna manual therapy for frozen shoulder together with acupuncture and cupping

(adhesive capsulitis). This clinical investigation revealed no significant safety risk associated with the intervention treatment. In individuals with FS, the intervention treatment appears to significantly improve quality of life, ROM, and pain levels..

MATERIALS AND METHODS

Study design used is Randomized control trial. The duration of study was 4 weeks. Total of 36 patients were selected who fulfilled inclusion criteria. Three Groups were made and 12 patients were included in each group. Sampling technique was non-purposive probability sampling technique.

Sample technique:

Inclusion criteria: Patients who had following features were included in the study:

- 30-50 years age group range, Both genders (male and females)
- Diabetic patient.
- Symptoms present up to 3 months.
- Restricted movements in ADLs.

Exclusion criteria:

Following subjects were excluded:

- Those having Cancer or any other chronic illness.
- Pregnancy
- Systemic disease
- Vertebral fracture
- Nerve root irritation
- Rotator cuff rupture

Data collection procedure:

This research was conducted in Department of Physical Therapy, Mayo Hospital Lahore after approval of synopsis. On the basis of inclusion and exclusion criteria for frozen shoulder pain, 36 patients were taken and divided in 3 groups randomly. Before treatment, informed consent was taken and complete procedure was discussed in native language. The examination included data that had undergone both subjective and objective examination. The demographic information related to patient having knowledge of age, sex, past

medical history, social and economic interests, related to marriage, related to education, time span of pain, quality and location of symptoms was taken. I performed physical checkup and examination was also done on SPADI that has two aspects, one aspect is of pain and second aspect is for functions. Pain aspect has 5 questions related to pain of patient and Functional aspect has 8 questions related to functional abilities of patient. It helps in assessment after that patient was randomly assigned to receive either high grade mobilization or Low-grade mobilization technique. Numeric Pain Rating Scale (NPRS) was also used for numerical assessment of pain. Allocation of patients in three equal groups was random. On 0th day ROMs of shoulder joint of all patients were assessed by using goniometer and recorded for measuring outcomes.

Group A receive:

High grade mobilization

Group A received expert mobilization methods. Intensities were used in accordance with Maitland grades III and IV. Depending on the patient's tolerance ("treating the stiffness"), the time duration of continuous stress on the shoulder capsule in the end-range position was adjusted. The patient was told to let the therapist know how much and what kind of pain they were experiencing both during and after therapy.The therapist adjusts the direction or intensity of mobilization if pain negatively affects how the procedures are carried out (by increasing reflex muscle activity). The mobilization procedures were applied to patients who felt a dull discomfort but no enhanced reflex muscle activity. Patients were advised that this ache would linger for a few hours following the treatment session, and that the strength of the mobilization techniques would be lowered in the following session if the pain became greater or persisted for longer than four hours ("treatment soreness"). However, no patient reported this complaint.

3 sets for 10 repetitions with 1-minute rest between each set was given thrice a week for 4 weeks to each patient.

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Group B receive:

Low grade mobilization I expressly told the patients that all techniques would be applied without generating shoulder pain, in contrast to the regimen employed for the A group. Mobilization procedures were started at the fundamental starting positions, and Grade I and II joints were used for translation and distraction techniques since they are close to the joint's neutral position.

Each patient received three sets of 10 repetitions with a 1-minute break in between each set, three times each week for four weeks.

Reflex muscle activity, amplitude of movements Because reflex muscle activity can be a preliminary sign of joint pain, it was closely monitored. If joint mobility increases, mobilization methods should be modified, and the amplitude of motions will grow without going beyond the range of motion constraints (grade II). Passive PNF patterns were used in the supine position during the final three minutes of each treatment session while operating in the pain-free zone.

Codman pendular exercises

Additionally, two minutes of prone Codman pendular movements were done to move the shoulder joint in multiple directions at once and to fully relax the shoulder muscles.
Each patient received 3 sets of 10 repetitions of each exercise, with a minute of rest in between sets, three times each week for four weeks.

Group C receive:

Conventional therapy

Subjects received exercise regimens and heat packs. The exercise therapy regimen includes wand, pulley, finger ladder, and Codman's pendulum activities, as well as active and active aided range of motion exercises, isometric exercises, and pectoral stretching. Everyone will be instructed to perform the Home Exercise Program (HEP) at least twice each day.

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RESULTS

Table 4: General Linear Models

Descriptive Statistics

	Mean	Std. Deviation	N
PreTreatment SPADI score in group 1	80.5769	3.29841	12
mid treatment SPADI score in group 1	37.6282	2.30672	12
Post treatment SPADI score 1n group 1	5.0000	1.95429	12

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.998	3055.94[b]	2.000	10.000	.000
	Wilks' Lambda	.002	3055.94[b]	2.000	10.000	.000
	Hotelling's Trace	611.187	3055.94[b]	2.000	10.000	.000
	Roy's Largest Root	611.187	3055.94[b]	2.000	10.000	.000

a. Design: Intercept
Within Subjects Design: factor1

b. Exact statistic

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Result: -

General linear models showed that pretreatment SPADI test gave 80.57±3.29 value and mid 37.62±2.30 and post treatment 5.00±1.95

Table 5: Normality test:

Tests of Normality

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pre treatment NPRS score	Group 1	.329	12	.001	.843	12	.030
	Group 2	.321	12	.001	.699	12	.001
	Group 3	.250	12	.037	.828	12	.020
PreTreatment SPADI score	Group 1	.242	12	.051	.854	12	.041
	Group 2	.210	12	.151	.925	12	.331
	Group 3	.164	12	.200*	.938	12	.471
Pre tretmant surapinatous Mannual muscle testing	Group 1	.279	12	.011	.784	12	.006
	Group 2	.203	12	.186	.916	12	.255
	Group 3	.374	12	.000	.640	12	.000
pre treatment infraspinatous Manual muscle testing	Group 1	.530	12	.000	.327	12	.000
	Group 2	.417	12	.000	.650	12	.000
	Group 3	.241	12	.052	.894	12	.133
Pre treatment sub scapularis Manual muscle testing	Group 1	.257	12	.028	.807	12	.011
	Group 2	.241	12	.052	.894	12	.133
	Group 3	.374	12	.000	.640	12	.000
Pre treatment teres minor Manual muscle testing	Group 1	.530	12	.000	.327	12	.000
	Group 2	.372	12	.000	.763	12	.004
	Group 3	.257	12	.028	.807	12	.011

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Result:

Table shows that; Shapiro-Wilk test for normality of data was normally distributed for all ROM, SPADI and NPRS with p- value greater than 0.05.

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Table 6: Paired Samples test

1. **Factor 1 NPRSG 1**

Estimates

Measure: nprsg1

factor1	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	8.833	.241	8.303	9.364
2	4.667	.333	3.933	5.400
3	1.083	.379	.250	1.917

Pairwise Comparisons

Measure: nprsg1

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	4.167*	.322	.000	3.458	4.875
	3	7.750*	.429	.000	6.807	8.693
2	1	-4.167*	.322	.000	-4.875	-3.458
	3	3.583*	.452	.000	2.589	4.577
3	1	-7.750*	.429	.000	-8.693	-6.807
	2	-3.583*	.452	.000	-4.577	-2.589

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

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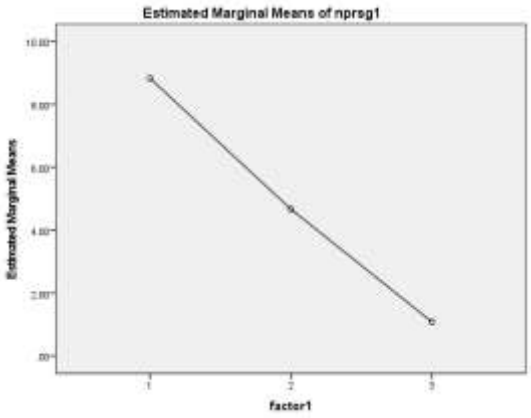

RESULT:

In paired wise comparison of group, A NPRSG 1 the mean values are 8.83, .66 and 1.08.

2-Estimated Marginal Means

Estimates

Measure: supraspinatusG1

factor1	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.167	.094	2.960	3.374
2	3.792	.156	3.447	4.136
3	4.625	.109	4.386	4.864

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Pairwise Comparisons

Measure: supraspinatusG1

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-.625*	.196	.009	-1.056	-.194
	3	-1.458*	.189	.000	-1.875	-1.042
2	1	.625*	.196	.009	.194	1.056
	3	-.833*	.178	.001	-1.224	-.442
3	1	1.458*	.189	.000	1.042	1.875
	2	.833*	.178	.001	.442	1.224

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.849	28.021[a]	2.000	10.000	.000
Wilks' lambda	.151	28.021[a]	2.000	10.000	.000
Hotelling's trace	5.604	28.021[a]	2.000	10.000	.000
Roy's largest root	5.604	28.021[a]	2.000	10.000	.000

Each F tests the multivariate effect of factor1. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

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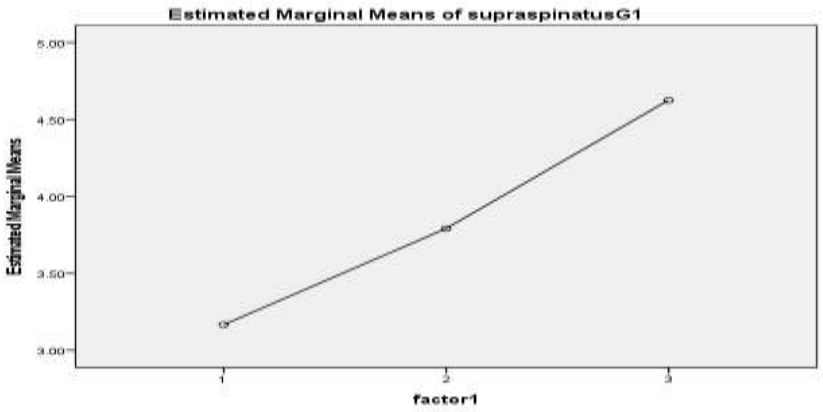

RESULT:

In paired wise comparison of group A supraspinatus the mean values are 3.167±0.094 3.792±0.156 and 4.625±0.109 which clearly presented the improvement in post analysis of muscle activity after treatment.

3: Scapularis Manual muscle pre, mid and post testing results of Group A

Descriptive Statistics

	Mean	Std. Deviation	N
Pre treatment sub scapularis Manual muscle testing in group 1	3.1250	.37689	12
mid treatment sub scapularis Manual muscle testing in group 1	3.7917	.49810	12
Post treatment sub scapularis Manual muscle testing in group 1	4.7083	.33428	12

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Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.849	28.021[b]	2.000	10.000	.000
	Wilks' Lambda	.151	28.021[b]	2.000	10.000	.000
	Hotelling's Trace	5.604	28.021[b]	2.000	10.000	.000
	Roy's Largest Root	5.604	28.021[b]	2.000	10.000	.000

a. Design: Intercept
Within Subjects Design: factor1

b. Exact statistic

RESULT:

Results: Pre mid and post treatment comparison of mean vales of scapularis manual muscles testing in group A gave 3.12±0.376, 3.79±0.498 and 4.70±0.334 values we see the vales improved in post treatment.

Descriptive Statistics

	Mean	Std. Deviation	N
pre treatment infraspinatus Manual muscle testing in group 1	2.9583	.14434	12
mid treatment infraspinatous Manual muscle testing in group 1	3.8333	.38925	12
Post treatment infraspinatous Manual muscle testing in group 1	4.5833	.41742	12

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Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.953	102.000[b]	2.000	10.000	.000
	Wilks' Lambda	.047	102.000[b]	2.000	10.000	.000
	Hotelling's Trace	20.400	102.000[b]	2.000	10.000	.000
	Roy's Largest Root	20.400	102.000[b]	2.000	10.000	.000

a. Design: Intercept
Within Subjects Design: factor1
b. Exact statistic

RESULT: Pre mid and post treatment comparison of ranges in group A had showed that infraspinatus muscle before treatment 2.95±0.144 which was improved to 4.58± 0.417 with the significant value of 0.000 which was less than 0.05 showing that improve ranges.

Table 6: ANOVA
Petreatment ANOVA

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Pre treatment NPRS score	Group 1	12	8.8333	.83485	.24100	8.3029	9.3638	7.00	10.00
	Group 2	12	9.0833	.99620	.28758	8.4504	9.7163	8.00	10.00
	Group 3	12	8.0000	.73855	.21320	7.5307	8.4693	7.00	9.00
	Total	36	8.6389	.96074	.16012	8.3138	8.9640	7.00	10.00
PreTreatment SPADI score	Group 1	12	80.5769	3.29841	.95217	78.4812	82.6726	76.92	86.15
	Group 2	12	81.6026	2.18702	.63134	80.2130	82.9921	78.46	86.15
	Group 3	12	81.2179	2.06037	.59478	79.9089	82.5270	76.92	83.85
	Total	36	81.1325	2.53787	.42298	80.2738	81.9912	76.92	86.15
Pre tretmant surapinatous Mannual muscle testing	Group 1	12	3.1667	.32567	.09401	2.9597	3.3736	2.50	3.50
	Group 2	12	3.0833	.70173	.20257	2.6375	3.5292	2.00	4.50
	Group 3	12	3.2083	.25746	.07432	3.0447	3.3719	3.00	3.50
	Total	36	3.1528	.46012	.07669	2.9971	3.3085	2.00	4.50
pre treatment infraspinatous Manual muscle testing	Group 1	12	2.9583	.14434	.04167	2.8666	3.0500	2.50	3.00
	Group 2	12	3.0000	.36927	.10660	2.7654	3.2346	2.00	3.50
	Group 3	12	3.2083	.45017	.12995	2.9223	3.4944	2.50	4.00
	Total	36	3.0556	.35411	.05902	2.9357	3.1754	2.00	4.00
Pre treatment sub scapularis Manual muscle testing	Group 1	12	3.1250	.37689	.10880	2.8855	3.3645	2.50	3.50
	Group 2	12	3.2917	.45017	.12995	3.0056	3.5777	2.50	4.00
	Group 3	12	3.2083	.25746	.07432	3.0447	3.3719	3.00	3.50
	Total	36	3.2083	.36596	.06099	3.0845	3.3322	2.50	4.00
Pre treatment teres minor Manual muscle testing	Group 1	12	2.9583	.14434	.04167	2.8666	3.0500	2.50	3.00
	Group 2	12	2.8333	.53654	.15489	2.4924	3.1742	2.00	3.50
	Group 3	12	3.1250	.37689	.10880	2.8855	3.3645	2.50	3.50
	Total	36	2.9722	.39541	.06590	2.8384	3.1060	2.00	3.50

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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Pre treatment NPRS score	Between Groups	7.722	2	3.861	5.183	.011
	Within Groups	24.583	33	.745		
	Total	32.306	35			
PreTreatment SPADI score	Between Groups	6.443	2	3.222	.485	.620
	Within Groups	218.984	33	6.636		
	Total	225.427	35			
Pre tretmant surapinatous Mannual muscle testing	Between Groups	.097	2	.049	.219	.804
	Within Groups	7.313	33	.222		
	Total	7.410	35			
pre treatment infraspinatous Manual muscle testing	Between Groups	.431	2	.215	1.795	.182
	Within Groups	3.958	33	.120		
	Total	4.389	35			
Pre treatment sub scapularis Manual muscle testing	Between Groups	.167	2	.083	.608	.550
	Within Groups	4.521	33	.137		
	Total	4.687	35			
Pre treatment teres minor Manual muscle testing	Between Groups	.514	2	.257	1.710	.196
	Within Groups	4.958	33	.150		
	Total	5.472	35			

Above are the pretreatment test of the ANOVA.

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Multiple Comparisons

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Pre treatment NPRS score	Group 1	Group 2	-.25000	.35236	.760	-1.1146	.6146
		Group 3	.83333	.35236	.061	-.0313	1.6980
	Group 2	Group 1	.25000	.35236	.760	-.6146	1.1146
		Group 3	1.08333*	.35236	.011	.2187	1.9480
	Group 3	Group 1	-.83333	.35236	.061	-1.6980	.0313
		Group 2	-1.08333*	.35236	.011	-1.9480	-.2187
PreTreatment SPADI score	Group 1	Group 2	-1.02564	1.05166	.597	-3.6062	1.5549
		Group 3	-.64103	1.05166	.816	-3.2216	1.9395
	Group 2	Group 1	1.02564	1.05166	.597	-1.5549	3.6062
		Group 3	.38462	1.05166	.929	-2.1959	2.9652
	Group 3	Group 1	.64103	1.05166	.816	-1.9395	3.2216
		Group 2	-.38462	1.05166	.929	-2.9652	2.1959
Pre tretmant surapinatous Mannual muscle testing	Group 1	Group 2	.08333	.19218	.902	-.3882	.5549
		Group 3	-.04167	.19218	.974	-.5132	.4299
	Group 2	Group 1	-.08333	.19218	.902	-.5549	.3882
		Group 3	-.12500	.19218	.793	-.5966	.3466
	Group 3	Group 1	.04167	.19218	.974	-.4299	.5132
		Group 2	.12500	.19218	.793	-.3466	.5966
pre treatment infraspinatous Manual muscle testing	Group 1	Group 2	-.04167	.14139	.953	-.3886	.3053
		Group 3	-.25000	.14139	.196	-.5969	.0969
	Group 2	Group 1	.04167	.14139	.953	-.3053	.3886
		Group 3	-.20833	.14139	.316	-.5553	.1386
	Group 3	Group 1	.25000	.14139	.196	-.0969	.5969
		Group 2	.20833	.14139	.316	-.1386	.5553
	Group 1	Group 2	-.16667	.15110	.519	-.5374	.2041
		Group 3	-.08333	.15110	.846	-.4541	.2874

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Pre treatment sub scapularis Manual muscle testing	Group 2	Group 1	.16667	.15110	.519	-.2041	.5374
		Group 3	.08333	.15110	.846	-.2874	.4541
	Group 3	Group 1	.08333	.15110	.846	-.2874	.4541
		Group 2	-.08333	.15110	.846	-.4541	.2874
Pre treatment teres minor Manual muscle testing	Group 1	Group 2	.12500	.15825	.712	-.2633	.5133
		Group 3	-.16667	.15825	.549	-.5550	.2216
	Group 2	Group 1	-.12500	.15825	.712	-.5133	.2633
		Group 3	-.29167	.15825	.172	-.6800	.0966
	Group 3	Group 1	.16667	.15825	.549	-.2216	.5550
		Group 2	.29167	.15825	.172	-.0966	.6800

*. The mean difference is significant at the 0.05 level.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Mid treatment NPRS score	Group 1	12	4.6667	1.15470	.33333	3.9330	5.4003	3.00	6.00
	Group 2	12	4.8333	1.02986	.29729	4.1790	5.4877	3.00	6.00
	Group 3	12	4.8333	.71774	.20719	4.3773	5.2894	4.00	6.00
	Total	36	4.7778	.95950	.15992	4.4531	5.1024	3.00	6.00
mid treatment SPADI score	Group 1	12	37.6282	2.30672	.66589	36.1626	39.0938	33.85	40.77
	Group 2	12	39.3590	5.72673	1.65316	35.7204	42.9976	33.08	51.54
	Group 3	12	41.0256	9.53086	2.75132	34.9700	47.0813	33.08	61.54
	Total	36	39.3376	6.51976	1.08663	37.1316	41.5436	33.08	61.54
mid tretmant surapinatous Mannual muscle testing	Group 1	12	3.7917	.54181	.15641	3.4474	4.1359	3.00	4.50
	Group 2	12	3.9583	.45017	.12995	3.6723	4.2444	3.50	5.00
	Group 3	12	3.9167	.55732	.16088	3.5626	4.2708	3.00	5.00
	Total	36	3.8889	.50866	.08478	3.7168	4.0610	3.00	5.00
mid treatment infraspinatous Manual muscle testing	Group 1	12	3.8333	.38925	.11237	3.5860	4.0807	3.00	4.50
	Group 2	12	3.7917	.49810	.14379	3.4752	4.1081	3.00	4.50
	Group 3	12	3.9167	.59671	.17225	3.5375	4.2958	3.00	5.00
	Total	36	3.8472	.49018	.08170	3.6814	4.0131	3.00	5.00
mid treatment sub scapularis Manual muscle testing	Group 1	12	3.7917	.49810	.14379	3.4752	4.1081	3.00	4.50
	Group 2	12	4.0417	.45017	.12995	3.7556	4.3277	3.50	5.00
	Group 3	12	3.9583	.54181	.15641	3.6141	4.3026	3.00	5.00
	Total	36	3.9306	.49501	.08250	3.7631	4.0980	3.00	5.00
mid treatment teres minor Manual muscle testing	Group 1	12	3.7917	.45017	.12995	3.5056	4.0777	3.00	4.50
	Group 2	12	3.7917	.49810	.14379	3.4752	4.1081	3.00	4.50
	Group 3	12	3.6667	.71774	.20719	3.2106	4.1227	2.50	5.00
	Total	36	3.7500	.55420	.09237	3.5625	3.9375	2.50	5.00

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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Mid treatment NPRS score	Between Groups	.222	2	.111	.115	.892
	Within Groups	32.000	33	.970		
	Total	32.222	35			
mid treatment SPADI score	Between Groups	69.264	2	34.632	.806	.455
	Within Groups	1418.491	33	42.985		
	Total	1487.755	35			
mid tretmant surapinatous Mannual muscle testing	Between Groups	.181	2	.090	.336	.717
	Within Groups	8.875	33	.269		
	Total	9.056	35			
mid treatment infraspinatous Manual muscle testing	Between Groups	.097	2	.049	.193	.825
	Within Groups	8.313	33	.252		
	Total	8.410	35			
mid treatment sub scapularis Manual muscle testing	Between Groups	.389	2	.194	.784	.465
	Within Groups	8.188	33	.248		
	Total	8.576	35			
mid treatment teres minor Manual muscle testing	Between Groups	.125	2	.063	.194	.824
	Within Groups	10.625	33	.322		
	Total	10.750	35			

Above are the mid treatment test of the ANOVA.

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Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Mid treatment NPRS score	Group 1	Group 2	-.16667	.40202	.910	-1.1531	.8198
		Group 3	-.16667	.40202	.910	-1.1531	.8198
	Group 2	Group 1	.16667	.40202	.910	-.8198	1.1531
		Group 3	.00000	.40202	1.000	-.9865	.9865
	Group 3	Group 1	.16667	.40202	.910	-.8198	1.1531
		Group 2	.00000	.40202	1.000	-.9865	.9865
mid treatment SPADI score	Group 1	Group 2	-1.73077	2.67658	.796	-8.2986	4.8370
		Group 3	-3.39744	2.67658	.422	-9.9652	3.1703
	Group 2	Group 1	1.73077	2.67658	.796	-4.8370	8.2986
		Group 3	-1.66667	2.67658	.809	-8.2345	4.9011
	Group 3	Group 1	3.39744	2.67658	.422	-3.1703	9.9652
		Group 2	1.66667	2.67658	.809	-4.9011	8.2345
mid tretmant surapinatous Mannual muscle testing	Group 1	Group 2	-.16667	.21171	.713	-.6862	.3528
		Group 3	-.12500	.21171	.826	-.6445	.3945
	Group 2	Group 1	.16667	.21171	.713	-.3528	.6862
		Group 3	.04167	.21171	.979	-.4778	.5612
	Group 3	Group 1	.12500	.21171	.826	-.3945	.6445
		Group 2	-.04167	.21171	.979	-.5612	.4778
mid treatment infraspinatous Manual muscle testing	Group 1	Group 2	.04167	.20490	.977	-.4611	.5444
		Group 3	-.08333	.20490	.913	-.5861	.4194
	Group 2	Group 1	-.04167	.20490	.977	-.5444	.4611
		Group 3	-.12500	.20490	.816	-.6278	.3778
	Group 3	Group 1	.08333	.20490	.913	-.4194	.5861
		Group 2	.12500	.20490	.816	-.3778	.6278
mid treatment sub scapularis Manual muscle testing	Group 1	Group 2	-.25000	.20335	.445	-.7490	.2490
		Group 3	-.16667	.20335	.694	-.6656	.3323
	Group 2	Group 1	.25000	.20335	.445	-.2490	.7490
		Group 3	.08333	.20335	.912	-.4156	.5823
	Group 3	Group 1	.16667	.20335	.694	-.3323	.6656
		Group 2	-.08333	.20335	.912	-.5823	.4156
mid treatment teres minor Manual muscle testing	Group 1	Group 2	.00000	.23165	1.000	-.5684	.5684
		Group 3	.12500	.23165	.852	-.4434	.6934
	Group 2	Group 1	.00000	.23165	1.000	-.5684	.5684
		Group 3	.12500	.23165	.852	-.4434	.6934
	Group 3	Group 1	-.12500	.23165	.852	-.6934	.4434
		Group 2	-.12500	.23165	.852	-.6934	.4434

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		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Post treatment NPRS score	Group 1	12	1.0833	1.31137	.37856	.2501	1.9165	.00	5.00
	Group 2	12	1.0833	.66856	.19300	.6586	1.5081	.00	2.00
	Group 3	12	1.5000	1.00000	.28868	.8646	2.1354	.00	3.00
	Total	36	1.2222	1.01731	.16955	.8780	1.5664	.00	5.00
Post treatment SPADI score	Group 1	12	5.0000	1.95429	.56416	3.7583	6.2417	2.31	8.46
	Group 2	12	6.7358	2.30031	.66404	5.2743	8.1974	2.19	9.14
	Group 3	12	10.5513	1.14746	.33124	9.8222	11.2803	8.15	12.38
	Total	36	7.4290	2.96769	.49461	6.4249	8.4332	2.19	12.38
Post tretmant surapinatous Mannual muscle testing	Group 1	12	4.6250	.37689	.10880	4.3855	4.8645	4.00	5.00
	Group 2	12	4.7083	.25746	.07432	4.5447	4.8719	4.50	5.00
	Group 3	12	4.3750	.37689	.10880	4.1355	4.6145	4.00	5.00
	Total	36	4.5694	.36160	.06027	4.4471	4.6918	4.00	5.00
Post treatment infraspinatous Manual muscle testing	Group 1	12	4.5833	.41742	.12050	4.3181	4.8486	4.00	5.00
	Group 2	12	4.5000	.42640	.12309	4.2291	4.7709	4.00	5.00
	Group 3	12	4.1667	.32567	.09401	3.9597	4.3736	4.00	5.00
	Total	36	4.4167	.42258	.07043	4.2737	4.5596	4.00	5.00
Post treatment sub scapularis Manual muscle testing	Group 1	12	4.7083	.33428	.09650	4.4959	4.9207	4.00	5.00
	Group 2	12	4.7083	.25746	.07432	4.5447	4.8719	4.50	5.00
	Group 3	12	4.3750	.22613	.06528	4.2313	4.5187	4.00	4.50
	Total	36	4.5972	.31212	.05202	4.4916	4.7028	4.00	5.00
Post treatment teres minor Manual muscle testing	Group 1	12	4.5833	.35887	.10360	4.3553	4.8113	4.00	5.00
	Group 2	12	4.5417	.39648	.11445	4.2898	4.7936	4.00	5.00
	Group 3	12	4.2083	.45017	.12995	3.9223	4.4944	3.50	4.50
	Total	36	4.4444	.42725	.07121	4.2999	4.5890	3.50	5.00

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ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Post treatment NPRS score	Between Groups	1.389	2	.694	.658	.525
	Within Groups	34.833	33	1.056		
	Total	36.222	35			
Post treatment 6ui0-SPADI score	Between Groups	193.550	2	96.775	27.843	.000
	Within Groups	114.701	33	3.476		
	Total	308.251	35			
Post tretmant surapinatous Mannual muscle testing	Between Groups	.722	2	.361	3.092	.059
	Within Groups	3.854	33	.117		
	Total	4.576	35			
Post treatment infraspinatous Manual muscle testing	Between Groups	1.167	2	.583	3.787	.033
	Within Groups	5.083	33	.154		
	Total	6.250	35			
Post treatment sub scapularis Manual muscle testing	Between Groups	.889	2	.444	5.818	.007
	Within Groups	2.521	33	.076		
	Total	3.410	35			
Post treatment teres minor Manual muscle testing	Between Groups	1.014	2	.507	3.112	.058
	Within Groups	5.375	33	.163		
	Total	6.389	35			

Results:
Post treatment comparison of RANGES in all groups had showed that, mean values of in group A was 1.0833±1.311, in group B was 1.0833 ± 0.668 and in group C 1.50 ± 1.00 with p-value 0.000. Showing that high grade mobilization exercises were more effective than other techniques. Before treatment and after treatment the mean vales presented the improvement.

DISCUSSIONS

A total of 36 patients were involved in this investigation. This study was comparative. There were 3 patient groups, each with 12 patients. Group A received expert mobilization methods. Intensities were used in accordance with Maitland's grades III and IV. Depending along each patient's tolerance, that is the capacity to bear glides, the amount of time that the shoulder capsule was subjected to extended stress in the end-range position changed. The patient also provided information regarding the type and severity of their discomfort both during and after treatment. The therapist changed the direction or degree of mobilization as previously mentioned when pain adversely affected the application of the mobilization procedures (by increasing the reflex muscle activation). However, all of the patients felt content and relaxed. For four weeks, we performed three sets of 10 repetitions each with a one-minute break. The therapist has expressly told the patients in Group B that all procedures will be employed without generating shoulder pain or any discomfort; unlike the protocol used for the A group. With the joint close to its neutral position, displacement and distracting techniques were used to begin mobilization techniques in the fundamental initial positions.

Techniques for joint mobilization are thought to have a variety of positive outcomes. The stimulation of nerve endings and suppression of peripheral proprioception underlie the neurocognitive impact.When particular movements target the particular regions of the capsular tissue, the mechanical changes may include tearing up contractures, reshaping elastic, or enhancing fiber glide. By causing prolonged duration stress, alteration in synovial fluid, enhancing the interchange of synovium with chondrocytes, and increasing synovial fluid renewal, mobilization procedures are also designed to improve or preserve joint range of motion and flexibility.

Following treatment, a comparison of RANGES across all groups revealed that group A's mean values were 1.0833 1.311, group B's were 1.0833 0.668, and group C's were 1.50 1.00, all with a p-value of 0.000. Demonstrating the superiority of high-grade mobilization exercises over other methods. The mean values showed improvement both before and after the treatment. Pre, mid, and post treatment comparison of ranges in group A revealed that the infraspinatus muscle's ranges improved from 2.95 0.144 before treatment to 4.58 0.417 after treatment, with a significant value of 0.000 that was less than 0.05

CONCLUSION

This study shows that all methods for treating adhesive capsulitis of the shoulder are successful in reducing discomfort and enhancing range of motion. It is concluded from the study that high-grade mobilization technique of muscles from all groups provides a significant therapeutic response on Ranges SPADI and NPRS scales based on post-assessment comparison of ranges of pain and disability index on ANOVA. When using high-grade mobilization strategies to treat an adhesive capsulitis patient with shoulder pain, ANOVA analysis using SPSS revealed a substantial therapeutic result. The high-grade mobilization strategy is more effective in this study, according to the comparison of data analysis results. Future research, in our opinion, should target the fact that if mobilizations applied at end range of tissue resistance are equally fruitful when applied in early stages of pathology and later stages or not. **References:**

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