

## EFFECTIVENESS OF AXIAL RELEASE AND SUSTAINED MOBILIZATION ON SHOULDER ELEVATION IN INDIVIDUALS WITH ADHESIVE CAPSULITIS – A PROSPECTIVE AND COMPARATIVE STUDY

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### ABSTRACT

**Objective:** The aim of the study was to investigate the comparative effectiveness of axial release and sustained mobilization on shoulder elevation in individuals with adhesive capsulitis.

**Methods:** The present study recruited total 30 participants diagnosed as adhesive capsulitis as per the inclusion and exclusion criteria. They were allocated into Group A and Group B according to convenient sampling. Participants in Group A were treated with conventional physiotherapy, axial release, and sustained mobilization technique and Group B received Maitland mobilization with conventional physiotherapy. The interventions were given for 4 weeks, 3 sessions/week for 30 min. The outcome measures used in the study were numerical pain rating scale, shoulder pain and disability index, and universal goniometer which was assessed before the intervention immediately after the first session and at 2<sup>nd</sup> week and on completion of 4<sup>th</sup> week.

**Results:** When the data statically analyzed intragroup group comparisons found to be significantly reduced in terms of pain and shoulder pain and disability index and improvement in Shoulder range of motion ( $p < 0.05$ ). Intergroup comparisons also showed significant difference in both the groups, but the results were more significant in Group A ( $p < 0.05$ ).

**Conclusion:** Both interventions in the form of articular and soft-tissue mobilization should be incorporated in the management of adhesive capsulitis.

**Keywords:** Adhesive capsulitis, Axial release, Sustained mobilization.

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### INTRODUCTION

Progressive inflammation of glenohumeral joint capsule results in capsular contracture and adhesion formation which is commonly known as adhesive capsulitis. Pain around involved shoulder and classical limitation in capsular pattern is the hallmark signs of adhesive capsulitis [1-3]. A study done in Manipur India in 2018 reported prevalence of adhesive capsulitis with 45.8%, with higher rates of affection in urban population with predominance in females and age group 50–59 years [4]. Evidence till the date reported various traumatic and non-traumatic causes of adhesive capsulitis like prolonged immobilization after the fractures around humerus or may be as a result of chronic diabetes mellitus. Individuals with adhesive capsulitis presents with complaints of pain and difficulty in overhead activities and in personal care activities (donning and doffing clothes) [5,6].

Biomechanically flexion and abduction through elevation requires clearance of greater tuberosity of humerus under the sub acromial arch which is done by supraspinatus muscle by producing external rotation and with adequate elasticity of capsule in normal circumstances; however, majority of individuals with adhesive capsulitis presents with contracted capsule and spasmodic internal rotators (Subscapularis Muscle) which is hidden culprit for limiting shoulder elevation by limiting external rotation [1,7].

Various management strategies have been employed for reduction of pain, improving range of motion and restoring functions in individuals with adhesive capsulitis include medications such as non-steroidal anti-inflammatory drugs, surgical release of contracted capsule and muscles, similarly physiotherapy plays a major role in the management of adhesive capsulitis.

Physiotherapy in the form of electrotherapeutic modalities (TENS, IFT, Ultrasound, SWD, etc.) and exercise therapy (isometric, pendular, and active assisted exercises) and integrated manual therapy approaches such as Maitland, Mulligan, Kaltenborn, and soft-tissue mobilization such as Cyriax and Myofascial release are proven to be effective [8-10].

However, considering the previous literature reports the interventions which are targeting the contracted capsule and induce relaxation in the spasmodic internal rotators of shoulder joint, which are the sources of limiting external rotation and elevation required for most of the daily activities of living is lacking. Hence, this study aims to find out the comparative effectiveness of sustained mobilization and axial release of internal rotator muscles in reduction of pain and improving ease to carry out activities requiring shoulder elevation in adhesive capsulitis.

### METHODS

A purpose of the study was to investigate the comparative effectiveness of axial release and sustained mobilization on shoulder elevation in adhesive capsulitis. Total 43 participants with Adhesive capsulitis were screened for the study as per the inclusion and exclusion criteria, out of which 13 didn't meet the inclusion criteria. A total of 30 participants between the age group of 40–60 years were included in the study. The total duration of the present study was from December 2020 to May 2021. The interventions were given for 4 weeks, 3 sessions/week for 35 min each session. The outcomes were assessed immediately after the first session at the end of 2<sup>nd</sup> week and on completion of 4<sup>th</sup> week. The study was approved by the institutional ethics committee the participants were briefed about the assessment and treatment protocol and the written informed consent form was obtained from all the participants. The participants were allocated into two groups based on convenient

**Table 1: Demographic and clinical data of the participants in axial release and sustained mobilization group and conventional and maitland mobilization group**

Demographic characteristics	Axial release and sustained mobilization group	Conventional and Maitland mobilization group	t	p
Age (years)	50.26±6.01	51.33±5.32	0.51	0.61 (NS)
Gender (male/female)	10/5	10/5	0.00	1.00 (NS)
Weight (kg)	74.46±7.63	74.46±7.63	0.00	1.00 (NS)
Height (cm)	169.73±8.63	169.73±8.63	0.00	1.00 (NS)
BMI (kg/m <sup>2</sup> )	25.91±2.79	25.91±2.79	0.00	1.00 (NS)

BMI: Body mass index, NS: Not significant

**Table 2: Improvement in active shoulder joint range of motion in axial release and sustained mobilization group and conventional and maitland mobilization group**

	Immediate	2 <sup>nd</sup> week	4 <sup>th</sup> week
Axial release and sustained mobilization group (Student's paired t-test)			
NPRS	24.72±9.26	55.02±11.19	88.80±8.18
SPADI (%)	-	46.07±14.04	74.88±11.18
Flexion (°)	25.69±11.40	319.98±149.86	598.36±189.23
Abduction (°)	36.85±13.75	442.15±153.82	810.41±312
External rotation (°)	18.23±11.05	42.87±18.41	172.49±48.55
Conventional and Maitland mobilization group (Student's paired t-test)			
NPRS	22.78±16.44	51.18±18.97	59.75±19.25
SPADI (%)	-	22.85±6.90	44.23±7.53
Flexion (°)	7.41±15.32	59.60±22.77	166.08±53.89
Abduction (°)	20.36±15.84	97.38±63.46	225.09±86.49
External rotation (°)	19.08±19.71	67.55±31.36	114.29±50.52
Comparison between two groups (Student's unpaired t-test)			
NPRS	0.39, p=0.69 (NS)	0.67, p=0.50 (NS)	5.37, p=0.0001 (significant)
SPADI (%)	-	5.73, p=0.0001 (significant)	8.80, p=0.0001 (significant)
Flexion (°)	3.70, p=0.001 (significant)	6.65, p=0.0001 (significant)	8.50, p=0.0001 (significant)
Abduction (°)	3.04, p=0.005 (significant)	8.02, p=0.0001 (significant)	7.00, p=0.0001 (significant)
External rotation (°)	0.14, p=0.886 (NS)	2.62, p=0.014 (significant)	3.21, p=0.003 (significant)

NS: Not significant, SPADI: Shoulder pain and disability index, NPRS: Numeric Pain Rating Scale

sampling, the two groups were Group A: Axial release with sustained mobilization technique and conventional physiotherapy (n=15) Group B: Conventional physiotherapy with Maitland mobilization (n=15) (Fig. 1).

#### Inclusion criteria

- Males and females to be included
- Age range 40–60 years
- Individuals with clinical diagnosis of adhesive capsulitis.

#### Exclusion criteria

- Individuals with past history of trauma or recent fractures around shoulder
- Individuals with impingement syndrome or rotator cuff tear
- Individuals with past history of shoulder dislocations.

#### Outcome measures

- Numerical pain rating scale [11]
- Universal goniometer [12]
- Shoulder pain and disability index (SPADI) [13].

#### Procedure

##### In group A

All participants received sustained mobilization and axial release in 30 min sessions for three times a week for 4 weeks (Figs. 2 and 3), for this purpose individuals were asked to sit on stool without arm rest, then the assistant were asked to take participants shoulder into abduction with elbow extension and therapist placed his one hand posterior to involved shoulder and the other anteriorly. The assistant

were asked to apply gentle traction by gripping just above wrist and the therapist applied sustained mobilization force anterior to posterior direction and sustained it for 20 s. For axial release after the assistant applied traction therapist palpated the spasmodic subscapularis and release was given by moving finger pads clock and anti-clock wise.

##### In group B

All participants received conventional therapy and Maitland mobilization in 30 min sessions, conventional physiotherapy given in the form of Hydro collator packs, isometric exercises. Maitland mobilization was given as per the illustration described by Maitland; preferably posterior and inferior glides were used in the present study [14].

#### RESULTS

The study was commenced to investigate the effectiveness of axial release and sustained mobilization on shoulder elevation, pain and shoulder pain and disability index in individuals with adhesive capsulitis. For this purpose the data was collected by principal investigator immediately after the intervention, at the interval of 2<sup>nd</sup> week and completion of 4<sup>th</sup> week for all the outcome measures. Statistical analysis was carried out using SPSS software trial version 27 and test of significance like student's paired and unpaired t-test were used and results were postulated to be significant if p<0.05.

#### Demographics

A total of 43 participants with Adhesive capsulitis were screened for the study as per the inclusion and exclusion criteria, out of which 11 didn't meet the inclusion Criteria and 2 lost the follow up. Axial release and sustained

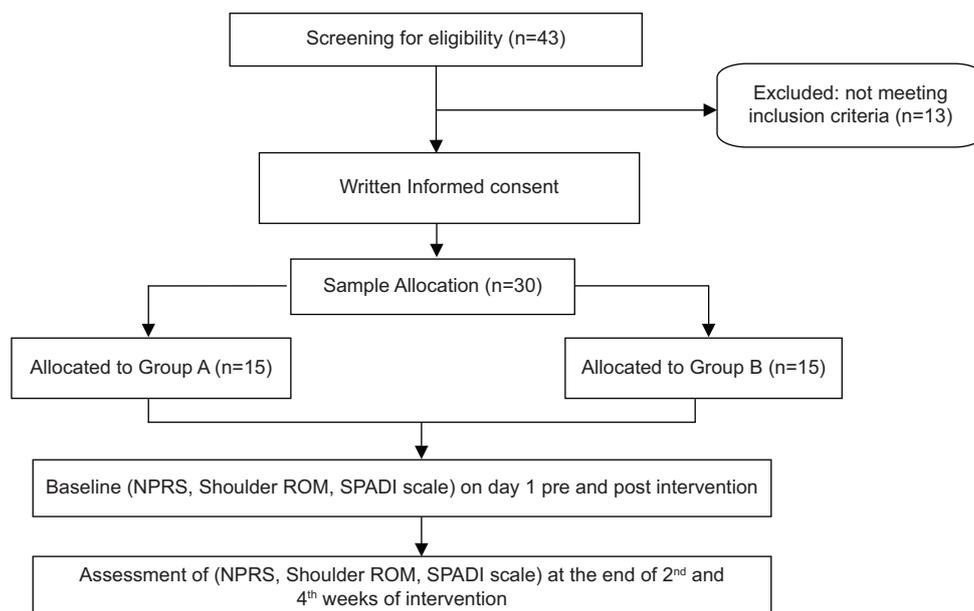


Fig. 1: Flow chart showing procedure used in the study



Fig. 2: Sustained mobilization with traction



Fig. 3: Axial release of subscapularis muscle

mobilization group had 15 participants with mean age of  $50.26 \pm 6.01$  years and body mass index (BMI) mean was  $25.91 \pm 2.79$  kg/m<sup>2</sup>. Conventional physiotherapy and Maitland mobilization group also had 15 participants with mean age of  $51.33 \pm 5.32$  years and BMI mean was  $25.91 \pm 2.79$  kg/m<sup>2</sup>. The mean difference of all data was statistically not significant ( $p > 0.05$ ). Baseline demographic and clinical data was comparable (Table 1).

#### Pain relief

The intragroup comparisons showed significant difference immediately after the intervention, after 2<sup>nd</sup> week and end of 4<sup>th</sup> week ( $p < 0.05$ ), whereas there was no significant difference in the inter group comparison on pain relief ( $p > 0.05$ ) Immediately after the intervention and at end of 2<sup>nd</sup> week, however Results were more significant at the end 4<sup>th</sup> week in axial release and sustained mobilization group ( $p \leq 0.0001$ ).

#### SPADI

Intragroup comparisons of SPADI score assessed after 2<sup>nd</sup> and 4<sup>th</sup> week of intervention showed statistically significant improvement ( $p < 0.001$ ). The inter group comparison also showed statistically significant improvement ( $p < 0.001$ ).

#### Active shoulder range of motion

Active shoulder elevation through flexion, abduction and glenohumeral external rotation was measured with help of universal goniometer. The ranges were measured immediately after the intervention, after 2 week

and at the end of 4<sup>th</sup> week. Intergroup comparisons showed Statistically Significant improvement immediately after the intervention at the end of 2 and 4<sup>th</sup> week in shoulder elevation through flexion and abduction ( $p \leq 0.05$ ), whereas Glenohumeral external rotation ranges were significant only after the 2<sup>nd</sup> and 4<sup>th</sup> week of intervention ( $p \leq 0.05$ ) in both the groups but the overall improvement was greater in axial release and sustained mobilization group. Intragroup comparison showed that shoulder elevation through flexion and abduction and glenohumeral external rotation range of motions results were more significant on 2<sup>nd</sup> and 4<sup>th</sup> week of intervention ( $p \leq 0.05$ ), whereas the results for glenohumeral external rotation were not significant immediate after the intervention ( $p \geq 0.05$ ) (Table 2).

#### DISCUSSION

In the present study all the interventions administered to group A and B for Shoulder Joint were effective in terms all outcomes in individuals with adhesive capsulitis. However, overall improvement was greater in Group A as compared to Group B.

#### Pain relief

In the present study pain intensity reduced significantly in both the groups immediately, at the end of 1 week and at the end of 2 week. The reduction in pain intensity may be attributed to stimulation of mechanoreceptors and simultaneous inhibition of type-4 nociceptive receptors, release tension from tender points, and localized increased in blood flow which washes out pain causing substance. Corresponding

evidence reported by Sinha *et al.* in 2019 and Yang *et al.* in 2007 showed similar effects in individuals with adhesive capsulitis when treated with articular and soft mobilization techniques [1,15].

#### Active shoulder range of motion

The possible cause of reduced range of motion of shoulder flexion and abduction through elevation found in literature are pain, muscle spasm, capsular contracture, adhesion formation and Joint stiffness etc. In the present study proposed reason for the improvement in active shoulder range of motion could be facilitation provided by the soft tissue techniques in the form of axial release technique which caused reduction in pain by breaking the cycle of pain- muscle spasm-pain as a result of induced relaxation in spasmodic muscles and additive effect exerted by manual Mobilization technique in the form of sustained mobilization which resulted in Stretching of contracted capsule and restoring normal joint accessory motions, and hence improvement in shoulder range of motion. The result of the present study is consistent with available literature a studies done by Yang *et al.* 2012 and Hm *et al.* 2000 reported the effectiveness manual mobilization techniques applied at various range of motions (end range mid-range mobilization) in adhesive capsulitis [16,17].

#### SPADI

The SPADI score were documented after 2<sup>nd</sup> week and on completion of 4<sup>th</sup> week of interventions. The proposed reason for the reduction of disability and hence improvement in Glenohumeral joint function in the present study could be related to combined response of reduced pain intensity and improved range of motion of Glenohumeral joint.

#### CONCLUSION

Both interventions in the form of articular and soft-tissue mobilization were effective and should be incorporated as a adjunct to other Physiotherapy interventions in the management of adhesive capsulitis.

#### Limitations

- Present study focused on participant with adhesive capsulitis so the findings are applicable within this category only.

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#### CONFLICT OF INTEREST

None declared.

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