Original Research Paper

Volume - 10 | Issue - 12 | December - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Physiotherapy

ADDED EFFECT OF ACROMIOCLAVICULAR JOINT MWM ON PAIN, RANGE OF MOTION (EXTERNAL ROTATION AND ABDUCTION) AND FUNCTIONAL DISABILITY IN ADHESIVE CAPSULITIS OF SHOULDER

Shreya Singh* (BPTH), Mumbai *Corresponding Author

Dr. Pooja Gulunjkar (MPTH Ortho), Pune

Dr. Snehal Ghodey (MPTH Ortho), Pune

ABSTRACT **BACKGROUND AND OBJECTIVES:** Adhesive capsulitis is a condition characterised by painful, progressive and disabling loss of active and passive GH joint range in multiple plane. The capsular pattern is represented by external rotation as the most limited motion followed by abduction and internal rotation. **OBJECTIVES:** To assess the shoulder range by using goniometer and SPADI scale in effect of AC joint mobilisation. Twenty six individuals with stage 2 and 3 restricted GH range were selected. Subjects who were willing to participate in study and fulfill inclusion and exclusion criteria were included and randomly classified into experimental group(n=13), which received therapy consisting of IFT, hot pack, AC joint MWM(3 sets of 10 reps) and conventional exercises while the control group(n=13) received treatment without AC joint MWM. The conventional exercise included codmann's , shoulder wheel, finger ladder, maitland for shoulder, wand exercises and capsular stretching exercises. Pain levels were assessed using NPRS scale and shoulder ROM using universal goniometer. **RESULTS:** Both groups had extremely significant improvement in outcome measures. However, Experimental group showed better results than control group. **CONCLUSION:** The combination of AC Joint MWM along with conventional therapy was effective in increasing GH range and alleviating pain after 2 weeks.

KEYWORDS : Adhesive Capsulitis, Gh Joint Range Of Motion, Ac Joint - Mobilization With Movement , Conventional Exercises.

INTRODUCTION

Adhesive capsulitis is an enigmatic condition characterized by painful, progressive and disabling loss of active and passive GH joint range in multiple planes. It is termed as primary if it occurs independent of other pathologies or secondary if it occurs with trauma or any other condition[4]. The capsular pattern at the shoulder is represented by external rotation as the most limited motion followed by abduction and internal rotation.[1] There are three stages: The first stage is Preadhesive stage which characterised by persistent and intense pain even at rest. The second stage is frozen stage which is characterised by pain with movemenent, significant adhesions and limited GH motion in all planes. The third stage is Thawing stage, characterised by minimal pain but significant capsular restrictions.

The shoulder complex which comprises of clavicle, scapula and humerus is a comprehensively designed joint involving Glenohumeral ,Acromioclavicular, Scapulothoracic and Sternoclavicular joint linking the thorax and upper extremity. The Glenohumeral joint has the greatest mobility amongst all other joints[14]. This inter-relationship gets disrupted when injury occurs to one or more of the components due to overuse or trauma. This compromises the shoulder movement resulting in pain, stiffness or weakness of muscles leading to substantial disability.[15] Adhesive capsulitis patients usually present in the sixth decade of life, and onset before the age of 40 is uncommon. The peak age is 56 and occurs more often in women than men. The non-dominant shoulder is likely to get affected. The disease process particularly affects the anterosuperior joint capsule and the coracohumeral ligament.[5]

The AC joint is a diarthrodial , synovial joint comprised of the distal end of the clavicle articulating with the acromion process of the scapula and may include a fibro cartilaginous medial, internal/external rotation about a vertical axis and an anterior /posterior tipping or tilting about an axis. AC Joint provides the scapula with additional range of rotation on the thorax, which allows scapula to adjust outside of its initial plane (posterior tipping and internal rotation). Recent biomechanical studies demonstrated that ACJ's significant role in all shoulder motion should not be overlooked in any pain of shoulder joint.[6] To date, few studies have been published on AC Joint kinematics. Conway's investigations lead to assess the range of motion at AC joint by using a static sliding device. These values were converted to angular measures. Findings indicated that approximately 30 degrees of upward rotation and 8 degrees of external rotation occurred at the AC joint during a combined movement of full humeral flexion and external rotation.[6] AC joint restrictions are typically the first joint affected by postural asymmetries as seen in long standing adhesive capsulitis. Flatow and colleagues reported that the acromial under surface and rotator cuff tendons are in closest proximity between 60^0 and 120^0 of elevation. Conditions limiting external rotation or elevation may increase the rotator cuff compression[15].Adhesive capsulitis is associated with decreased joint mobility, therefor in the present study, mobilisation technique like AC joint MWM was evaluated for its effectiveness on pain, range of motion (external rotation and abduction) and functional disability in adhesive capsulitis of shoulder with the conventional treatment.

METHOD

Aim

To study the added effect acromioclavicular joint MWM on pain, range of motion (external rotation and abduction) and functional disability in Adhesive Capsulitis of Shoulder.

Procedure

The patients having shoulder pathology, diagnosed of having adhesive capsulitis were included in the study. A written informed consent was taken from all the patients who participated in the study. A detailed explanation about the purpose and procedure of the study was given to all the patients before beginning the intervention. A total of 45 patients, both males and females were screened for the study. Demographic data was taken along with medical history of diabetes/non-diabetes, medications taken, ranges of shoulder, the pain evaluation and outcome measure (SPADI). Out of them 26 patients were included in the study depending on their fulfillment of the inclusion criteria mentioned above. All the recruited subjects were examined for ranges of shoulder, pain on activity and on rest as per the evaluation sheet. Primary Outcome measures of the study were then assessed using Universal Goniometer for assessing ranges of shoulder, Numerical Pain Rating Scale (NPRS) for pain intensity and Shoulder Pain And Disability Index (SPADI). Patients included in the study were distributed into two groups: Experimental(Group A)and Conventional (Group B) by random sampling - chit method .Whenever patient was selected for study, a chit was picked from a pouch consisting chits of added effect of AC Joint MWM and conventional treatment and the patient was assigned to that group. After group allocation, the subjects were then assessed for outcome measures before beginning the intervention.

Outcome measures

For measuring pain Numerical Pain Rating Scale (NPRS) was used,

for measuring ranges of shoulder Universal Goniometer was used and for functional status Shoulder Pain And Disability Index scale was used.

Pain measured by NPRS scale
The pain intensity was assessed using Numerical Pain Rating scale (NPRS). Validity and reliability of NPRS has been established. A 10cm line was drawn where 0 and 10 were marked at the beginning and at the end of the scale which indicated no pain and worst pain possible respectively and the patient was then instructed to indicate the numeric value .

Shoulder Range of motion by universal goniometer
The ranges of shoulder (external rotation and abduction) were assessed using Universal Goniometer. The patients were asked to attain a supine position. For external rotation, shoulder should be in 90^0 of abduction and elbow fixed to 90^0 . The fulcrum is the olecranon process of ulna. The stationary arm is aligned vertically and the moving arm is parallel to the ulna. For abduction range, shoulder should be in 0^0 of shoulder flexion and extension. The fulcrum should be at anterior aspect of acromion process. The stationary arm is parallel to sternum and the moving arm is parallel to the midline of humerus. The ranges of the shoulder were noted and the readings were taken and documented.

Functional Disability assessed by SPADI Scale
Similarly, SPADI was explained to the patient. It consists of two dimensions, one for the pain and the other for functional activities. The pain dimensions consisted of five questions regarding the severity of an individual's pain. Functional activities were assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper extremity use. The patient was asked to mark for each question. The interpretation was done after the scoring.

The inclusion criteria was patients in age group of 40-60 years are included,both male and females were included, Pre diagnosed Adhesive capsulitis,Stage 2 and 3 of Adhesive capsulitis,Diabetics and non-diabetics included,Subjects with bilateral/unilateral adhesive capsulitis. The eclusion criteria was Recurrent dislocation of shoulder,Any nerve pathology, fracture of shoulder,Degenerative changes in neck, systemic problems (cardiac),any surgical conditions,AC joint injuries,malignancy,Adhesivecapsulitis secondary to fracture and Rotator cuff tears and other shoulder ligament injuries.

Intervention
Patients in Group A were treated with AC Joint MWM and conventional exercise program and patients in group B were treated with conventional exercise program.

Group A: AC Joint MWM with conventional exercise program
All the patients in this group were given AC joint MWM with conventional exercise .

ANTERIOR GLIDE OF CLAVICLE ON ACROMION
Patient is positioned in sitting .The hand placement with the patient sitting, the therapist will stand behind the patient and stabilize the acromion process with the fingers of their lateral hand.The thumb of the therapist's hand pushes downward through the upper trapezius and is placed posteriorly on the clavicle, just medial to the joint space. The mobilizing force of the therapist will push the clavicle anteriorly with their thumb and will ask the patient to perform abduction movement.

INFERIOR GLIDE OF CLAVICLE ON ACROMION
Patient is positioned in sitting, arm at side.The therapist will place the tips of both thumbs on the superior surface of clavicle. Therapist will push the clavicle inferiorly with their thumb and will ask the patient to perform the abduction movement.

DOSAGE: 3 sessions/week for 2 weeks, 3 sets of 10 repetitions per session with 30 sec rest period in between the sets.

Group B: Conventional exercise program
The subjects in the conventional group received a session of:
IFT (4 Pole vector around the shoulder) for 15 minutes,Hot pack for 10 minutes over the shoulder region,Maitland Postero-anterior Glide for external rotation and Inferior glide for abduction (Grade 2 and 3), 1-2 oscillation per second for 1 min, (4-5 sets).Capsular stretching exercises- 3 times/session with 30 sec hold and Active Assisted exercises for shoulder joint using Wand for shoulder flexion, abduction,internal and external rotation ,Shoulder wheel,Finger ladder for flexion and abduction and Codman's exercises. All exercises are repeated for 10 times/session.

AC JOINT MWM
INFERIOR GLIDE TO AC JOINT

ANTERIOR GLIDE TO AC JOINT

Statistical analysis
Data was analyzed using Graph pad Prism version 8.0.

Parametric data
Within the group analysis for range of motion was done using paired t-test and between two groups (A and B) was done using unpaired t-test.

Non-Parametric data
Within the group analysis for numerical pain rating scale (NPRS) and SPADI was done using Wilcoxons signed rank test and between the

groups (A and B) was done using Mann Whitney U-test.

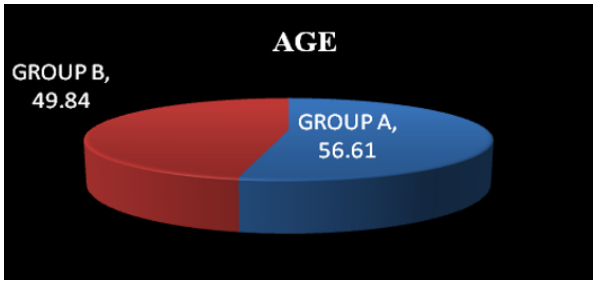
Level of significance was set at p≤0.05.

RESULTS

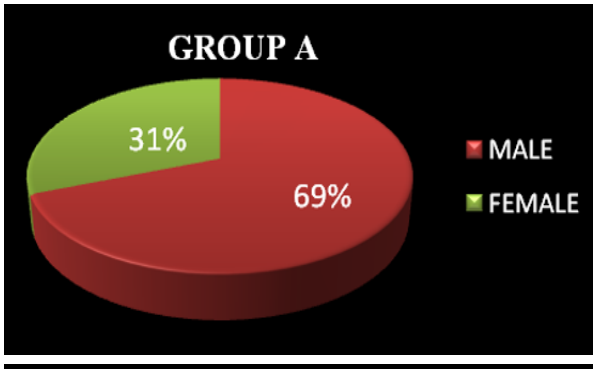
The above statistical analysis was performed on 26 patients recruited.Graph 5 (Table 2) and Graph 9 (Table 3) shows the difference in pain intensity on NPRS within AC Joint MWM (Group A) and conventional exercise program (Group B)respectively. The mean value for pain reduced from 4.76 pre-treatment to 3.07 post treatment in Group A and from 4.46 pre- treatment to 2.69 post-treatment in Group B with p value 0.00.Similarly, the range of external rotation showed a difference from 39.46 to 60.61 in Group A and from 50.15 to 55.23 in Group B, as per Graph 6 (Table 2) and Graph 10 (Table 3). For abduction the difference was from 112.07 to 126.46 in Group A and from 109.92 to 121 in Group B as per Graph 7 (Table 2) and Graph 11(Table 3).SPADI showed a difference from 47% to 41% in Group A as per Graph 8(Table 2) and from 49% to 42% in Group B as per Graph 12 (Table 2).The result of paired t-test within the group for range of motion (external rotation and abduction) was significant.The result of Wilcoxons Signed rank test within the group for NPRS and SPADI was significant.The result of unpaired t-test between the groups for range of motion (external rotation) was not significant, except abduction.The result of Mann Whitney U-test between the groups for NPRS and SPADI was not significant.Hence proving , there is not a significant difference in reducing pain, improving ROM and functional disability between both the groups.

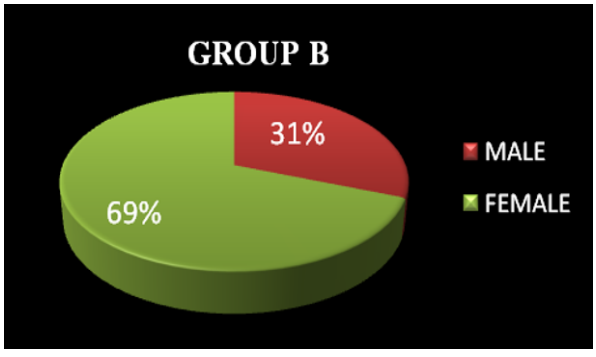
Tables and graphs

Demographic Data	GROUP A (Mean±S.D)	GROUP B (Mean±S.D)
Age	56.61±5.73	49.84±6.60



Demographic data - Age





Gender Distribution

TABLE 1: Within the group analysis of Pain , ROM and SPADI in Group A

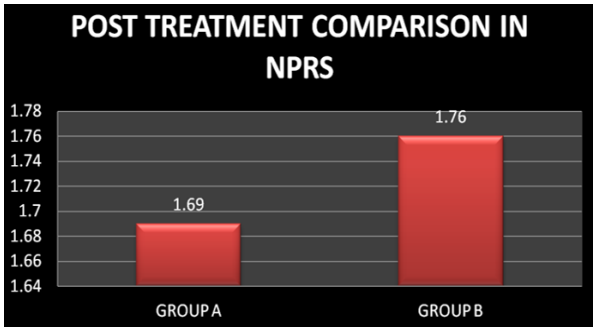
Outcome measure	Pre Rx (Mean ± S.D)	Post Rx (Mean ± S.D)	P value	Significance
Pain	4.76±0.72	3.07±0.95	0.0011	Significant
ROM	39.46±19.52	60.61±18.83	0.00001	Significant
External rotation	112.07±16.86	126.46±14.67	0.00001	Significant
Abduction				
SPADI	47±4.0	41±0.04	0.0007	Significant

TABLE 2: Within the group analysis of Pain , ROM and SPADI in Group B

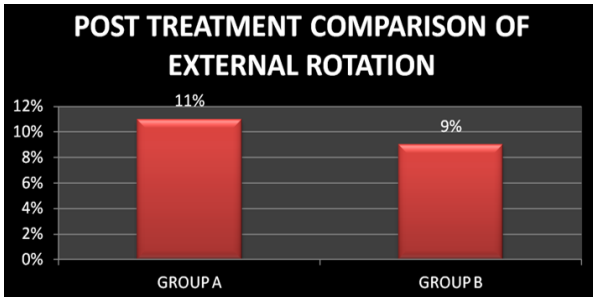
Outcome measure	PRE Rx (Mean ± S.D)	POST Rx (Mean ± S.D)	P value	Significance
Pain	4.46±0.87	2.69±1.10	0.00074	Significant
ROM	50.15±12.91	55.23±14.87	0.03	Significant
External rotation	109.92±16.11	121±15.00	0.00001	Significant
Abduction				
SPADI	49±0.05	42±0.07	0.00074	Significant

TABLE 3: Between two group analysis of Pain, ROM and SPADI

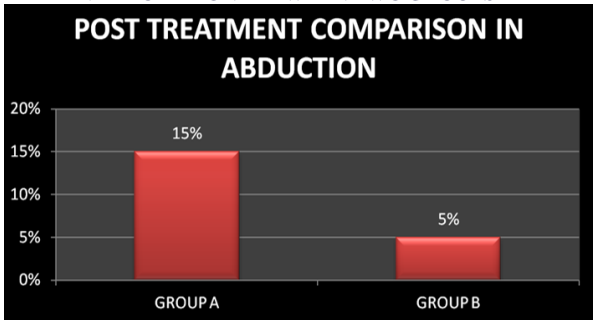
Outcome measure	GROUP A (Mean ± S.D)	GROUP B (Mean ± S.D)	P value	Significance
Pain	1.69±0.94	1.76±0.59	0.13	Not significant
ROM	11.00±3.00	9.00±0.015	0.73	Not significant
External rotation	15.00±0.06	5.00±0.027	0.0001	*Significant
Abduction				
SPADI	5.00±0.02	7.00±0.03	0.13	Not significant



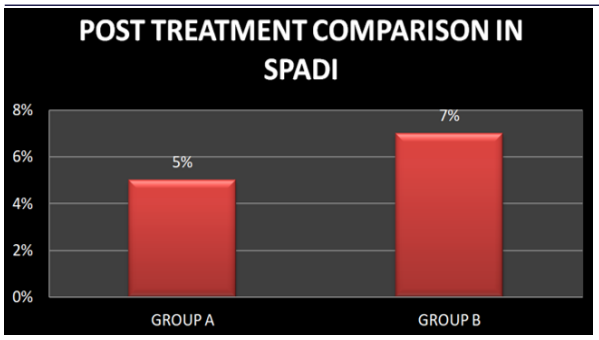
GRAPH 3.1: POST TREATMENT DIFFERENCE IN PAIN BETWEEN TWO GROUPS



GRAPH 3.2: POST TREATMENT DIFFERENCE IN EXTERNAL ROTATION BETWEEN TWO GROUPS



GRAPH 3.3: POST TREATMENT DIFFRENCE IN ABDUCTION BETWEEN TWO GROUPS



GRAPH 3.4: POST TREATMENT DIFFERENCE IN SPADI BETWEEN TWO GROUPS

RESULTS

The above statistical analysis was performed on 26 patients recruited.Graph 5 (Table 2) and Graph 9 (Table 3) shows the difference in pain intensity on NPRS within AC Joint MWM (Group A) and conventional exercise program (Group B)respectively. The mean value for pain reduced from 4.76 pre-treatment to 3.07 post treatment in Group A and from 4.46 pre- treatment to 2.69 post-treatment in Group B with p value 0.00.Similarly, the range of external rotation showed a difference from 39.46 to 60.61 in Group A and from 50.15 to 55.23 in Group B, as per Graph 6 (Table 2) and Graph 10 (Table 3). For abduction the difference was from 112.07 to 126.46 in Group A and from 109.92 to 121 in Group B as per Graph 7 (Table 2) and Graph 11(Table 3).SPADI showed a difference from 47% to 41% in Group A as per Graph 8(Table 2) and from 49% to 42% in Group B as per Graph 12 (Table 2).The result of paired t-test within the group for range of motion (external rotation and abduction) was significant.The result of Wilcoxons Signed rank test within the group for NPRS and SPADI was significant.The result of unpaired t-test between the groups for range of motion (external rotation) was not significant, except abduction.The result of Mann Whitney U-test between the groups for NPRS and SPADI was not significant.Hence proving , there is not a significant difference in reducing pain, improving ROM and functional disability between both the groups.

DISCUSSION

This experimental study was performed to compare the added effect of AC Joint MWM with conventional exercise program on pain, range of motion (external rotation and abduction) and functional disability in adhesive capsulitis of shoulder. After matching the demographic characteristics for pain, range of motion and functional disability, baseline parameters were matched to maintain uniformity for post treatment comparison and a total of 26 patients were analyzed. In the present study, we established the efficacy of each interventional program individually by pre post treatment analysis.

Results of the present study demonstrated a significant difference in all the three outcome measures in patients treated with AC Joint MWM for 2 weeks.However, a non-significant difference was observed in in all the three outcome measures on inter-group comparison analysis except abduction range. Therefore,both the treatment protocols were found to be equally effective in treatment of adhesive capsulitis.

One group of study population was treated with AC Joint MWM with the conventional exercise program for 2 weeks. The statistical analysis revealed that AC Joint MWM was effective in reducing pain by 16.9 % which is significant as per the minimal detectable change which is one point or a reduction of 15%, and functional disability by 6% . In the study, done by Kevin.D.Harris, he used maitland mobilization techniques on AC Joint to determine the changes in pain and disability in patients with adhesive capsulitis. Statistically significant and clinically meaningful improvements were observed in all the outcome measures at 2 weeks.[2]

To support result of my study, Julio Silva,in an article,suggested the use of MWM on AC Joint to increase range of motion and reduce the pain. He suggested the application of MWM on the shoulder with a single glide, which is sustained during the execution of the active movement. As, external rotation is beneficial to the sub acromial space which allows clearance of greater tuberosity[21],the analysis of the positional failure of the AC Joint and the possible anatomical considerations can be identified, for better understanding of the MWM effects, indications and contraindications[20].

In the study done by Yang et al. In 2012 , he performed end range , mid range mobilization and MWM. Statistically significant improvements were seen in end range mobilization and MWM. Additionally, MWM corrected the scapula-humeral rhythm.[22]

Another outcome measure along with pain and SPADI was range of motion.We also studied the effectiveness of AC Joint MWM on range of motion (external rotation and abduction) using Universal goniometer. We found significant improvement in range of motion in patients treated with AC Joint MWM for 2 weeks showing significant positive effects ($p \leq 0.05$). Thus , our documented results confirms the effectiveness of AC joint MWM on adhesive capsulitis. The present findings indicate the role of AC Joint MWM. AC joint restrictions are typically the first joint affected by postural asymmetries as seen in long standing adhesive capsulitis. So , even the minor restrictions at these primary upper extremity joints sets off the mechanoreceptive muscle/joint reflex arcs that produces sympathetic muscle guarding in the associated joints and soft tissues of the shoulder[6]. Joint mobilization can restore the accessory movement , eliminate the positional failure and recover the physiological movement.

Other group of study was treated with conventional exercise program for 2 weeks. Here also the pain and functional disability showed significant difference in conventional group ($p \leq 0.05$). There was reduction in pain by 17.7% whereas disability showed 7% improvement when pre and post intervention parameters were compared in this group.This difference was clinically significant as discussed earlier.

Range of motion is an important outcome measure along with pain and disability. Results of this study revealed that even range was also enhanced in Group B.There was statistically significant difference on intra group comparison post 2 week program ($p \leq 0.05$). Various studies favour the concept of conventional exercise program like Hui Bin Chan in a review article concluded that how physical therapy exercises have significant improvement in the outcome measures. The exercises given in Group B included maitland mobilization, active assisted ROM, codman's, shoulder wheel, pendulum exercises, capsular stretching, IFT and hot pack[19]. Superficial heating brings about increase in temperature, brings about easier contraction of muscles and improve motor function of muscles causing inhibition of pain signals.

The main finding of this study was that there was no significant difference observed in between the two groups with respect to all the outcome measures- pain, range of motion and functional disability($p \leq 0.05$). This suggests that both treatment protocols had similar effectiveness.

The possible explanation for similar effectiveness could be the intervention itself .Apart from specific treatment protocols, both the groups had common treatment given to all the patients which could have been the reason for inter –group non-significant difference post 2 weeks. Thus our interpretation of study was that there was no significant difference in Added effect of AC Joint MWM and conventional exercise program, hence both treatment protocol are equally effective to reduce pain, improve range of motion and reduce functional disability in adhesive capsulitis patients.

CONCLUSION

From the result of our study, it can be concluded that addition of AC joint MWM to conventional therapy caused significant improvement in Abduction range of motion post two weeks of intervention program. However it was also found that pain, External rotation range and functional disability showed similar result as conventional therapy alone.

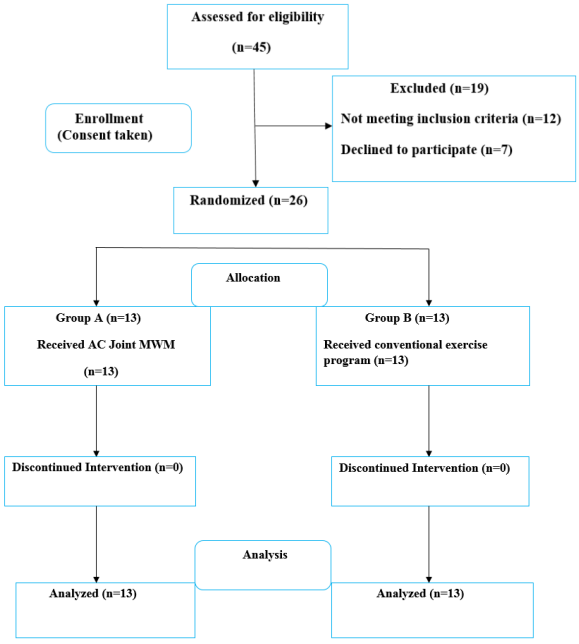
Limitation of study

In this protocol, the combination of AC joint MWM and conventional may produce the effects that may overlap, so further studies need to be done only with AC Joint MWM to find out its effect.

Treatment protocols were rigid and specific alterations were not done within the 2 week protocol. Occupational differences were not considered. Effects of medications were not considered which could

have altered the outcomes of our study.

PROJECT FLOW CHART (AS PER CONSORT GUIDELINES)



REFERENCES

1. Abhay kumar, Suraj kumar. Effectiveness of Maitland techniques in Idiopathic Shoulder Adhesive Capsulitis.(2012).
2. Kevin.D.Harris et al. Manual physical therapy for injection-confirmed Nonacute Acromioclavicular Joint Pain.(2012).
3. Russell et al. A blind , randomized , controlled trial assessing conservative management strategies for frozen shoulder.(2014)
4. Dabholkar Ajit. Effects of Mobilization with Movement (MWM) in Shoulder Impingement Syndrome Patients on Acromiohumeral Distance using ultrasonography.(2016).
5. Richard Dias. Frozen Shoulder.(2005).
6. Teece RM et al. Three dimensional acromioclavicular joint motions during elevation of arm.(2008).
7. Cristina Lirio Romero. Mobilization with Movement for Shoulder Dysfunction in Older adults: A Pilot Trial.(2015).
8. Ludwig PM et al. Three-dimensional scapular orientation and muscle activity at selected positions of humeral elevation.(1996).
9. Brian mulligan.Manual therapy.5TH EDITION
10. Wong .P.L.K. A review on Frozen shoulder, singapore med J (2010).
11. PJ Rundquist. Alterations in scapular kinematics in subjects with idiopathic loss of shoulder range of motion.(2007).
12. Gokhan Doner. Evaluation of Mulligan's technique for adhesive capsulitis of the shoulder.
13. Oke A.Anakwenze. Acromioclavicular Joint Pain in patients with adhesive capsulitis:A prospective outcome study.(2011).
14. Pamela K.Levangie,Cynthia C.Norkins.Joint Structure and Function,a comprehensive analysis,fourth edition.
15. Flatow EL,Soslowsky LJ.Excursion of the rotator cuff under the acromion:patterns of subacromial contact,Am J Sports Med22:779,1994.
16. Chin-Yin Mao.Frozen shoulder:Correlation between the response to physical therapy and follow-up shoulder arthrography.
17. Robert A.Donatelli.Frozen shoulder.Fourth edition.(2004)
18. Gopinath. Effect of Muscle Energy Technique and Conservative Exercises on pain, Range of motion and shoulder function with Adhesive capsulitis.(2016).
19. Hui Bin Chan.Physical therapy in the management of frozen shoulder(2017).
20. Julio Silva.Anatomical Considerations of the Acromioclavicular Joint for the Application of Mobilization with Movement.A Narrative review.
21. Ludewig PM,Reynolds.The association of scapular kinematics and Glenohumeral joint pathologies . J Ortho Sports Phys Ther.(2009).
22. J.L.Yanget al. Effectiveness of the end-range mobilization and scapular mobilization approach in subgroup of subjects with frozen shoulder syndrome: a randomized control trial.(2012)