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A COMPARATIVE STUDY OF SUSTAINED INFERIOR CAPSULAR STRETCHING VERSUS PASSIVE JOINT MOBILIZATION IN TREATMENT OF ADHESIVE CAPSULITIS

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ABSTRACT

Adhesive Capsulitis typically is referred to as the spontaneous onset of gradually progressive shoulder pain and severe limitation of movement. Features of this pathologic condition include microscopic evidence of chronic capsular inflammation with fibrosis and perivascular infiltration. Although several researchers found no evidence of inflammation, they concurred that fibrosis exists in the capsule, characterized by adhesions of synovial folds; obliteration of the joint cavity; and a thickened, contracted capsule that eventually becomes fixed to the bone. Aim: To compare the effectiveness of sustained inferior capsular stretching versus passive joint mobilization in the treatment of Adhesive Capsulitis. **Objectives:** 1)To compare effectiveness of sustained inferior capsular stretching versus passive joint mobilization in treatment of Adhesive Capsulitis 2)To compare the efficacy of sustained inferior capsular stretching and passive joint mobilization for the improvement in Range Of Motion(ROM) 3)To assess & compare pain reduction with both techniques. **Method:** 30 subjects of grade II Adhesive Capsulitis were randomly allocated to equal groups A and B of 15 each to receive sustained inferior capsular stretching and passive joint mobilization respectively. The outcome measures used were goniometer measurements and NPRS on day 1 and day 14 of treatment. **Result & conclusion:** The study concluded that Sustained inferior capsular stretching is more effective than passive joint mobilization in treatment of Adhesive Capsulitis. In 14 So it can be further used as an alternative to joint mobilization.

KEYWORDS: Sustained inferior capsular stretching, Adhesive capsulitis, Passive joint mobilization, Goniometer.

INTRODUCTION

The shoulder joint is a multi-axial ball and socket type of synovial joint that permits a wide range of movement. However, mobility is gained at the expense of stability. The spheroidal head of the humerus (the ball) articulates with the shallow glenoid fossa of the scapula (the socket). Both articular surfaces are covered with hyaline cartilage.

The fibrous capsule enclosing the shoulder joint is thin and loose allowing a wide range of movement. The capsule is attached medially to the glenoid fossa. Superiorly, the attachment of the long head of the biceps muscle within the joint. Laterally the fibrous capsule is attached to the anatomical neck of the humerus. The inferior part of the capsule is the weakest area. The shoulder articulation is a multiaxial ball-and-socket joint that allows movements around three axes and permits flexion-extension, abduction-adduction, circumduction, and rotation.[1]

Adhesive Capsulitis typically is referred to as the spontaneous onset of gradually progressive shoulder pain and severe limitation of movement. Features of this pathologic condition include microscopic evidence of chronic capsular inflammation with fibrosis and perivascular infiltration.It affects approximately 2% to 5% of general population and 10% to 15% of the population with diabetes. It is often considered a self limiting condition.[2]

Patho-anatomically there is an involvement of the capsule in the glenohumeral joint. The capsule volume is reduced and this is the cause for the restricted range of motion. The pattern in which adhesive capsulitis usually is developed may be described in three stages namely freezing, frozen & thawing stage. The predominant features of this condition are pain, restricted motion or stiffness in shoulder.[3]

One of the major current treatment options available for adhesive capsulitis is physiotherapy through the use of modalities such as application of moist heat or cold,

ROM & strengthening exercises, stretches & manual therapy along with providing patient education & home exercise program. Joint Mobilization techniquesapplied close to the articular surface in ventral, dorsal and inferior directions of the gleno-humeral joint are frequently used by physical therapists as an intervention for limited joint range of motion.[4] G.D. Maitland from Auckland, New Zealand developed a comprehensive manual therapy approach to painful joints which Rebound utilizes. His passive mobilization techniques for every joint in the body include very gentle methods designed to calm down irritable joints and tissues as well as more vigorous manipulation for specific joint lesions.[5]

Extensive evidence from numerous research studies has shown that stretching interventions can improve flexi-bility and increase ROM, but recommended protocols vary substantially. Passive stretching is a therapeutic maneuver designed to lengthen pathologically shortened soft tissue by using an external force, applied either manually or mechanically and thereby facilitate increase in range of motion.[6]

Although there are many treatment options available for Adhesive Capsulitis, in medical and physiotherapy management, the effectiveness of such treatments is lacking.[7,8] With a view of the above-mentioned gap, in the focus of management for Adhesive capsulitis, and positive evidence of sustained inferior capsular stretching and passive joint mobilization on the adhesive capsulitis, a specific protocol is required for the treatment. Sustained inferior Capsular stretching & passive joint mobilization both proved to be effective in the treatment of adhesive capsulitis, so out of these two which will be more effective will be practiced as first line of treatment.Aim of this study is to compare the effectiveness of sustained inferior capsular stretching and passive joint mobilization in treatment of Adhesive Capsulitis.

MATERIAL AND METHOD

Study Design: comparative study
Target population : Subjects with unilateral shoulder pain, stiffness, dysfunction.
Sample population: Patients with stage II adhesive capsulitis coming to physiotherapy OPD
Sampling method : Simple Random sampling
Sample size : 30 subjects.

Inclusion criteria

a) Age 40- 60 years
b) Pain and restricted range of motion of unilateral shoulder
c) Both sexes
d) Adhesive capsulitis stage II referred by orthopedician.

Exclusion Criteria

a) Fracture of the humerus, scapula, or clavicle
b) Shoulder dislocation, subluxation or ligament injury of the shoulder
c) Peripheral neurological involvement in the upper extremity.
d) Shoulder arthroplasty
e) Shoulder impingement syndrome
f) Mentally unstable patients.

Procedure

Subjects who fulfill the inclusion and exclusion criteria were included in the study and a written consent was taken from each of the subjects prior to participation. Instructions were given to the subjects about techniques performed.

A total of 30 subjects were divided equally into two groups A and B by random lottery method. Each group had 15 participants. The group A received sustained inferior capsular_stretching and the group B received passive joint mobilization. Before that interventions of each group started with moist heat as passive warm up and end with cryotherapy as passive cool down for 14 days. The outcome measures used were goniometer measurements for flexion and abduction of affected shoulder & Numerical Pain Rating Scale for pain. Data was analyzed. Each patient assessed on day 1st i.e. pre-treatment and on day 14th i.e. post- treatment.

The subjects of group A received sustained inferior capsular stretching with the help of coutertraction. The shoulder countertraction apparatus constitutes a overhead pulley on a wall-fixed L- shaped steel frame (2.5 feet in length) with free weights of approximately 2 to 3 kg fixed at one end of the rope (3 m in length) passing through the pulleys while the other free end of the rope is connected to the distal end of the subject's affected upper limb which is covered with a cuff and medium- sized bandage (similar to the application of a crepe bandage for skin traction) just above the elbow. The ends of the rope are connected with an S hook. The patient was positioned comfortably to sit upright in a chair with a back rest. Weight was added based on the body weight cutoff of 60 kg. If the patient weighs more than the cutoff value (≥ 60 kg), 3 kg was set as the distracted load, whereas if the patient weighs less than the cutoff value (< 60 kg), 2 kg was set as the distracted load. The intervention started by moist heat for 5 minutes, sustained inferior capsular stretching for 10 minutes and cryotherapy for 5 minutes. The total treatment time was 20 minutes once a day for 5 days per week for 2 weeks.

In group B, intervention started with moist heat for 5 minutes. Maitland mobilization posterior and inferior glide grade 3-4, for improvement in flexion and abduction respectively.

For posterior glide, patient in Supine, with the arm in resting position, grasping the distal humerus with lateral hand. The lateral border of top hand just distal to the anterior margin of_the joint, with fingers pointing

superiorly. This hand gives the mobilizing force. Glide the humeral head posteriorly by moving the entire arm. For inferior glide, patient in supine position with the arm abducted to the end of its available range, the patient's arm against trunk with the hand farthest from the patient. The web space of other hand just distal to the acromion process on the proximal humerus. With the hand on the proximal humerus, glide the humerus in an inferior direction.

These interventions administered for 2 minutes interspersed with a rest period of 30 seconds for 10-15 repetitions[23], for 10 minutes. Every session end with cold therapy for 5 minutes. The total treatment time was 20 minutes once a day for 5 days per week for 2 weeks.

RESULTS

The data analysis was done using the WINPEPI software version 11.38.For the analysis of matched observations the paired T test was applied using the PAIRS etc version 3.32 of the WINPEPI software version 11.38 programmes. The paired T test was done to test the intergroup significance.

In the comparative study 30 participants with stage II unilateral Adhesiev Capsulitis aged between 40-60 years of both genders were randomized into two groups. Group A with 15 patients were treated with sustained inferior capsular stretching. In Group B consisting of 15 patients were treated with passive joint mobilization. Participants were comparable without any statistically difference between their age, sex, weight, pre-treatment ROM and pre-treatment NPRS.

Both groups achieved improvement in range of motion and pain reduction, however more improvement seen in Group A. In Group A improvement in flexion and abduction is 38.6±3.9 and 35±4.2 respectively, while in Group B improvement in flexion and abduction is 28±5.6 and 30±5.8 respectively. (P value = $P \leq 0.005$). Also, pain reduction in Group A 3.8±5.6 and in Group B 4.66±0.7 (P value = $P \leq 0.005$.

Table 1: Flexion (Range of Motion).

ROM	Group A	Group B	'P' Value
Flexion (Post t/t – Pre t/t)	38.66° ± 3.99	28° ± 5.60	<0.001**

(t-test is applied, p value is significant if p<0.05 and highly significant if p<0.01.)

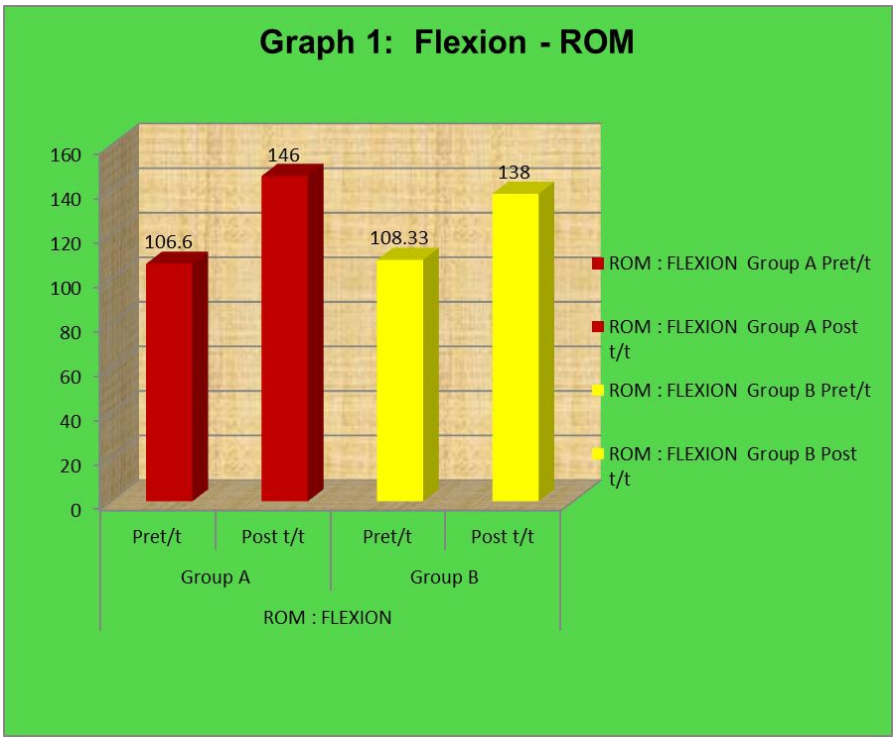


Table 2: Abduction (Range of Motion).

ROM	Group A	Group B	'P' Value
Abduction (Post t/t – Pre t/t)	35° ± 4.22	30.33° ± 5.81	<0.001**

(t-test is applied, p value is significant if p<0.05 and highly significant if p<0.01.)

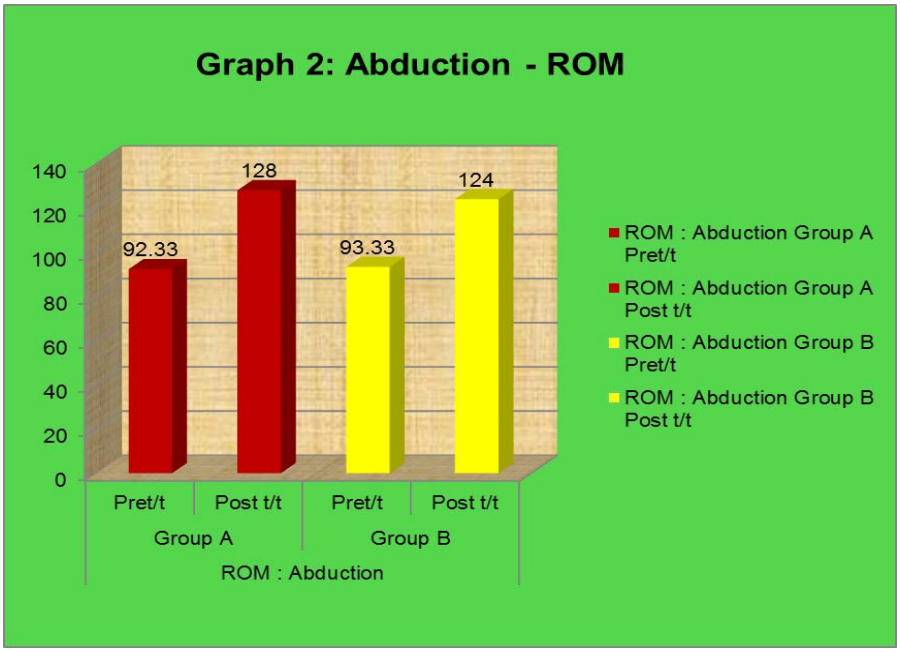
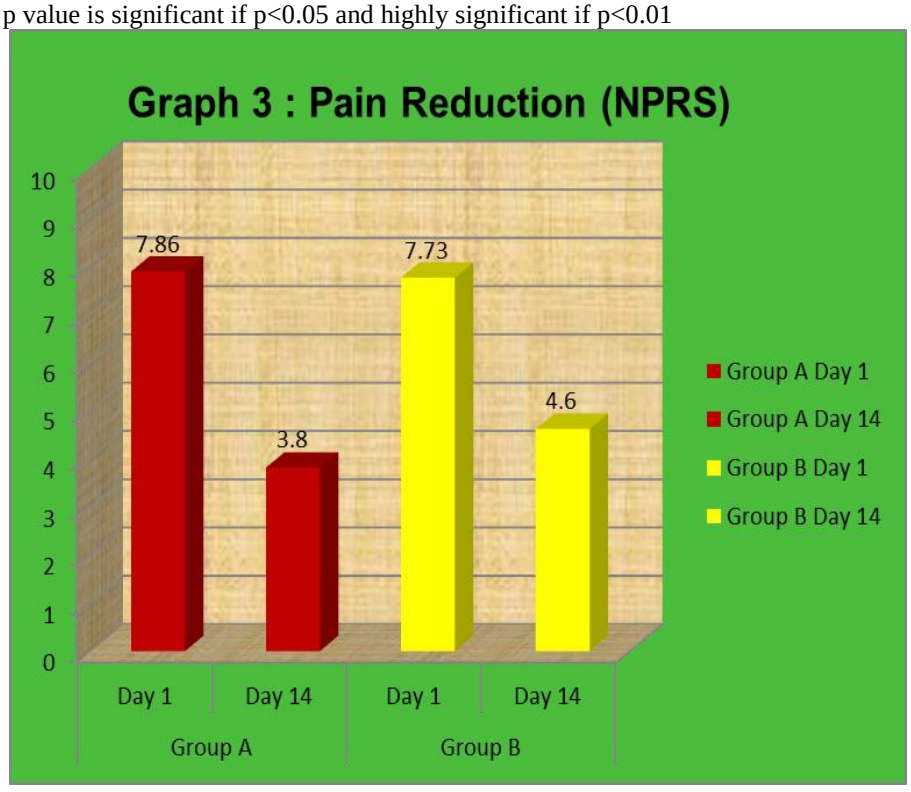


Table 3: Post-treatment NPRS in Group A & Group B.

Parameter	Group A	Group B	'P' Value
Post- treatment NPRS	3.8 ± 0.67	4.66 ± 0.62	0.001**

(t-test is applied, p value is significant if p<0.05 and highly significant if p<0.01



- The two groups were comparable with respect to age, weight, pretreatment ROM(Range of Motion), and pretreatment NPRS for pain. Mean age of patients in Group A was 51.86 years as compared to 50 years in Group B. Mean pretreatment ROM for flexion was 106.66° & for abduction was 92.33° in Group A. Similarly in Group B average pretreatment ROM for flexion was 108.33° & for abduction was 93.33°. No statistically significant difference was observed in these variables between the two groups. Average pretreatment NPRS in Group A was 7.86 & 7.73 in Group B.
- **Table 1,2 & Graph 1,2** there was a statistically significant difference (p value <0.001) observed

with improvement in ROM for flexion as well as abduction respectively between the two groups.

- Similarly in **Table 3 & Graph 3** difference in pain reduction was also significant (p value <0.001) as analyzed by NPRS

DISCUSSION

Various physiotherapy techniques have been described for treatment of Adhesive Capsulitis, but some studies of these techniques did not have a complete management program.[9] Few of the studies focused on capsular tightness and functional outcomes when compared with pain and stiffness.[10] From studies showing evidence of previous interventions such as manual therapy, stretching, and exercises for a adhesive capsulitis we focused on manually treating the affected shoulder either by passive joint mobilization or with sustained inferior capsular stretching.

Passive joint mobilization

Many authors and clinicians advocate joint mobilization for pain reduction and improved ROM.[11] Unfortunately, little scientific evidence exists to demonstrate the efficacy of joint mobilization over other forms of treatment for Adhesive capsulitis. However, patients treated with joint mobilization, with or without concurrent interventions, had better outcomes.[12] Specific joint mobilization techniques are believed to selectively stress certain parts of the joint capsule; for example, an inferior glide with the arm at the side, while in external rotation, would stress the Rotator cuff interval (RCI). While this may be true, it may be more beneficial to view the capsuloligamentous complex (CLC) through the circle concept. The circle concept refers to all regions of the CLC providing stability in all directions (ie, anterior structures providing anterior as well as posterior stability). When this concept is applied to the shoulder with limited glenohumeral motion, improved extensibility of any portion of the CLC results in improved motion in all planes. This concept appears supported by the findings of Johnson et al, who found significant improvement in external rotation motion in patients with adhesive capsulitis after performing posterior glide mobilizations sustained for 1 minute at end range of abduction and external rotation.[13] High-grade joint mobilizations (grades III and IV) are used to promote elongation of shortened fibrotic soft tissues. High-grade mobilizations should be performed with the joint positioned at or near its physiologic end range. It should be noted that immediate ROM gains made with manual techniques (joint mobilization or end-range stretching) represent transient tissue preconditioning.

Sustained inferior capsular stretching

Each stretch is designed to improve the flexibility of a specific region of the shoulder capsule and shoulder girdle. Proper performance of the stretching program should ensure balanced shoulder flexibility. A hypothesis behind technique of using countertraction was the concept of axial distraction, which when provided to the shoulder, allows for a greater gain in mobility at the end range. This subsequently increases shoulder mobility[14]. For continuous sustained axial traction, suspended weights by countertraction were used for the affected limb.

The basic strategy in treating structural stiffness is to apply appropriate tissue stress. It is helpful to think of the total amount of stress being applied as the “dosage,” in much the same way that dosage applies to medication. The primary factors that guide this process are pain and ROM. Adjusting the dose of tissue stress results in the desired therapeutic change (increased motion without increased pain). Three factors should be considered when calculating the dose, or total amount of stress delivered, to a tissue: intensity, frequency, and duration. The total end range time (TERT) is the total amount of time the joint is held at or near end-range position.[15] TERT is calculated by multiplying the frequency and duration of the time spent at end range daily, and is a useful way of measuring the dose of tissue stress. Intensity remains an important factor in tensile stress dose but is typically limited by pain. Traditional ROM exercises are considered lower forms of tensile stress, while the highest tensile stress doses are achieved by low-load prolonged stretching (LLPS), because TERT is maximized. Therefore, the goal with each patient is to determine the therapeutic level of tensile stress in patients with frozen shoulder.

SUSTAINED INFERIOR CAPSULAR STRETCH	**PASSIVE JOINT MOBILIZATION**
It acts at capsule (mainly inferior) responsible for pathological progress of Adhesive capsulitis	It acts at articular cartilage synovium & bone(all of which are not directly involved in pathogenesis)
Mechanism of Action : Capsular lengthening, Axial Distraction	It maintains available joint play & reduce mechanical limitations
IT HINDERS PATHOLOGICAL PROCESS (possibly)	**IT CANNOT HINDER PATHOLOGICAL PROCESS**

During the course of Adhesive capsulitis dense adhesions are formed between the capsular folds mainly in inferior part as capsule is loosen inferiorly resulting in capsular thickening and restrictions.[16] This resultant decrease in length of capsule causes restriction in ROM & pain. However there is no arthritic changes in cartilage and bone.

Now, having this pathological background of disease process, in sustained inferior capsular stretching countertraction is applied primarily to inferior capsule causing axial distraction & capsular lengthening. Thus it helps to hinder pathological process, while passive joint mobilization acts empirically at cartilage, synovium & bone maintaining available joint play & also reduce mechanical limitations.

Our study has some **limitations**. First, is the use of comparatively less reliability of measurement tools. However, we overcame this to an extent by having only one rater measure the outcomes for both groups. Second, we did not have a true control (no treatment) to determine the natural course of the disease, as it is unethical to not provide treatment. Third, we do not have followup of the patients, as this study involves the initial stage of research on using countertraction to find its primary outcome. Fourth, we could not show in detail with advanced measurement tools the rationale behind the effect of countertraction on capsular stretching. In future research, the biomechanical rationale behind the effect of countertraction would be studied with appropriate tools. Fifth, we did not consider all possible movement of shoulder inspite only focused on shoulder flexion and abduction movement, as inferior capsule mainly takes part in shoulder elevation activites, i.e. flexion and abduction and not other movements, further study will require for fulfilling the limitations.

CONCLUSION

Effective use of sustained inferior capsular stretching is better than passive joint mobilization for improvement in Range of Motion (ROM) & pain reduction in grade II Adhesive Capsulitis.

ACKNOLEDGEMENT

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