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Immediate Effectiveness of Subscapularis Positional Release Technique in Unilateral Adhesive Capsulitis: A Comparative Study

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ABSTRACT

Background: In adhesive capsulitis, subscapularis, the largest and strongest muscle of the rotator cuff, undergoes tightness, which affects the abduction and external rotation of shoulder. There are many physiotherapy interventions used in treatment of adhesive capsulitis and among them, positional release technique is a method in which evaluation and treatment is done using tender/trigger points and a position of comfort to resolve the associated dysfunctions like pain and tightness.

Objective: To compare the immediate effectiveness of subscapularis positional release technique in combination with shoulder capsular stretches over shoulder capsular stretches alone in patients with unilateral adhesive capsulitis.

Methodology: 20 Patients with unilateral adhesive capsulitis were selected and divided into two groups based on the selection criteria. Group A received Subscapularis Positional Release Technique along with capsular stretches and Group B received capsular stretches alone. Numerical Pain Rating Scale and Active Shoulder range of motion using Goniometry were used as outcome measures pre and post treatment.

Result: On comparing pre to post intervention values in Group A and Group B, there was significant improvement noted in terms of pain and shoulder ROM statistically, in both the both groups, but Group A showed more significant improvement.

Conclusion: The present study concluded that both the groups showed improvement statistically and clinically in terms of pain and shoulder ROM, but the participants who were given Subscapularis Positional Release Technique with capsular stretches showed more improvement compared to participants who were given capsular stretches alone.

Keywords: Adhesive capsulitis; Subscapularis; Positional release technique; Pain, ROM

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INTRODUCTION

Adhesive capsulitis is an inflammatory condition which causes fibroses of the glenohumeral joint capsule, it is accompanied by gradual progressive stiffness and significant restriction of range of motion, typically external rotation, abduction, and flexion.[1] Adhesive capsulitis is more prevalent in women and within diabetic population with an occurrence rate of 20%.[2] About 10% of people may

develop adhesive capsulitis in the other shoulder within 5–7 years of the first one and it has been estimated to affect at least one person in 50 every year. However, it tends to resolve more quickly than the first.[3] Adhesive capsulitis is also popularly known as frozen shoulder. It is characterized by initial painful and later progressively restricted active and passive Glenohumeral joint range of motion with spontaneous complete or nearly complete recovery over a varied period.[4]

Frozen shoulder is one of the most common musculoskeletal conditions encountered in the Indian population with a prevalence of almost 50% of older patients with diabetes and 10% in non-diabetic patients.[5] A primary frozen shoulder is when the exact cause is not known. It is more common in people with diabetes and with a thyroid gland problem. About 15% of patients link it to a minor injury to the shoulder. A secondary frozen shoulder can develop if the shoulder area is kept still for some time, for example, after a stroke or heart attack.[6,7] There are 3 phases of frozen shoulder, The painful/freezing phase, which can last for 2-9 months with gradual onset of pain at rest and sharp pain at extremes of motion. Stiff/ frozen phase which can last for 4-12 months. In this phase, the pain starts to subside, and there is progressive loss of Glenohumeral motion in a capsular pattern. And the Recovery/thawing phase which can last for 5-26 months, in this phase there is spontaneous, progressive improvement in the functional range of motion. It can also occur after major injury or surgery to the shoulder.[8,9,10] There is a change in the available space and the available volume around the Glenohumeral joint as the patient develops contractures through a frozen shoulder.[11] The capsule allows an estimated 2 to 3 millimeters of distraction, which is important for the glenohumeral joint. On its own, it provides little contribution to joint stability. However, the tendons of the rotator cuff muscles insert into the capsule. Therefore, the dynamic action of the rotator cuff can influence the tension within the capsule. Overall, both ligaments and muscles insert directly into the capsule, providing an indirect link to the joint stability of the glenohumeral joint.[12,13] Frozen shoulder has a distinct capsular pattern of stiffness in which external rotation is the most restricted followed by abduction, flexion, and internal rotation. Normally, the rotator cuff strength will still be normal except for pain inhibition.[14]

In Adhesive capsulitis, subscapularis, the largest and strongest muscle of the rotator cuff muscles covering the anterior surface of the scapulae undergoes tightness, which affects the abduction and external rotation of shoulder.[15] It originates from medial two-third of the subscapular fossa and inserts into the fibers from a tendon which inserts into the lesser tuberosity of the humerus and the front of the shoulder joint capsule. Supplied by upper and lower subscapular nerves which are innervated by posterior cord of the brachial plexus.[16,17] Subscapularis produces an inferior directed translation force on the humeral head, and it is the primary muscle that internally rotates the glenohumeral joint. Long term reduction of mobility and capsular irritation from subscapularis dysfunction results in adhesive capsulitis.[18,19]

The physiotherapy treatment for adhesive capsulitis includes use of modalities like Transcutaneous Electrical Nerve Stimulation, Interferential Therapy, Ultrasound therapy, Moist Heat Therapy etc.[20,21] Manual therapy for joint includes Mulligan's mobilization technique, Maitland's mobilization technique, etc. and for soft tissue release, techniques like myofascial release, trigger point release technique etc are administered.[22,23] Among them, Positional release technique is a method in which evaluation and treatment is done using tender/trigger points and a position of comfort to resolve the associated dysfunctions like pain and tightness.[24] It is an indirect and passive treatment accomplished by placing the involved tissue in an ideal position of comfort.[25] It acts on the muscle spindle and controls the muscle spasm.[26]

METHODOLOGY

Study Design: Experimental

Study Setting: Dr BR Ambedkar College of Physiotherapy, Dr BR Ambedkar Medical College and Hospital, Bangalore 560045.

Criteria For Sample Selection:

The patients were selected for the study based on the following criteria:

Inclusion Criteria

- Patient diagnosed with idiopathic unilateral adhesive capsulitis
- Pain in the shoulder joint ≥40% loss of active shoulder abduction and external rotation range of motion
- Aged between 40-60 years
- Duration of symptoms between 3-12 months

Exclusion Criteria:

- Secondary adhesive capsulitis associated with systemic diseases (diabetes, cardiovascular disorders etc.)
- Surgical procedures to shoulder (Total shoulder arthroplasty, manipulation under anaesthesia etc.)
- Any shoulder injuries or trauma

Sample Size: 20 participants

Sampling Method: Simple Random Sampling

The patients were randomly assigned into 2 groups, Group A and Group B in which Group A received subscapularis positional release technique with capsular stretches and Group B received capsular stretches alone.

Study Duration: 6 Months Treatment Duration: 10-15 minutes Procedure And Treatment:

Both, the Group A and Group B were assessed with the outcome measures, followed by administration of the treatment techniques, and were immediately reassessed with the same outcome measures.

Subscapularis Positional Release Technique

- The patients were asked to be in supine lying and close to the edge of the table with their arm held by the therapist slightly in abduction, extension, and internal rotation at the shoulder.
- The therapist palpated for the tender point which lies close to the lateral border of the scapula, on its anterior surface.
- The therapist applies a constant pressure over the tender point using two fingers for a duration of 30 seconds of 3 repetitions with 30 seconds of interval between each repetition.
- Subscapularis PRT was administered to Group A

Fig. 1: Therapist performing Subscapularis Positional Release Technique on model

CAPSULAR STRETCHES

Anterior Capsule Stretch

- Patients were asked to sit or kneel with their elbow and hand supported by a table beside the body and use hand of the uninvolved arm pressing down on the back of the closest part of their upper arm bone.
- They were asked to hold the position for 30 seconds of 3 repetitions with 30 seconds interval between each repetition.

Fig. 2: Model performing anterior capsular stretch

Inferior Capsule Stretch

- The patients were commanded to kneel with their elbow supported by a table beside and use their uninvolved arm and press down on the closest part of the upper arm bone.
- They were asked to hold the position for 30 seconds of 3 repetitions with 30 seconds interval between each repetition.

Fig. 3: Model performing inferior capsular stretch

- Capsular stretches were administered to both Group A and Group B

Outcome Measures

- Numerical pain rating scale – for pain assessment
- Goniometer – for assessing the active shoulder abduction and external rotation range of motion.

DATA ANALYSIS / RESULTS

Statistical analysis was done using SPSS 24 version. Descriptive statistics found using mean, SD and frequency percentage. Pre post comparison was done by paired t test between group comparison is done by unpaired t test. Significant level was set at 5%.

Demographic Data

Table 1: Distribution of units based on gender

Gender	Group		Total
	A	B	
Female	7	6	13
	70.0%	60.0%	65.0%
Male	3	4	7
	30.0%	40.0%	35.0%
Total	10	10	20
	100.0%	100.0%	100.0%

In Group A 70% are female and 30% are male

In Group B 60% are female and 40% are male

Graph 1: Distribution of units based on gender

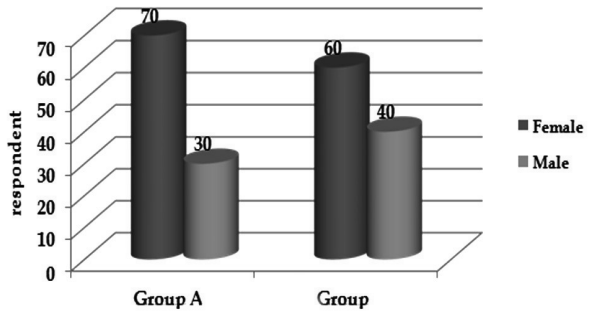
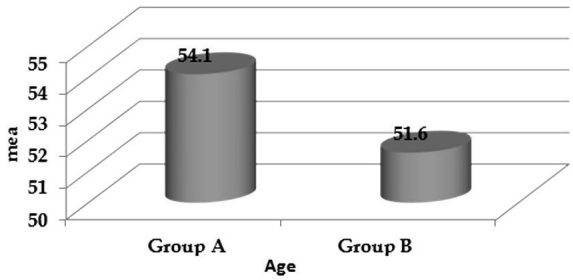


Table 2: Mean and SD of age

	Group	N	Mean	Std. Deviation
Age	A	10	54.10	8.184
	B	10	51.60	6.345

In Group A average age is 54.1 ± 8.184 and in Group B average age is 51.6 ± 6.345

Graph 2: Mean and SD of age



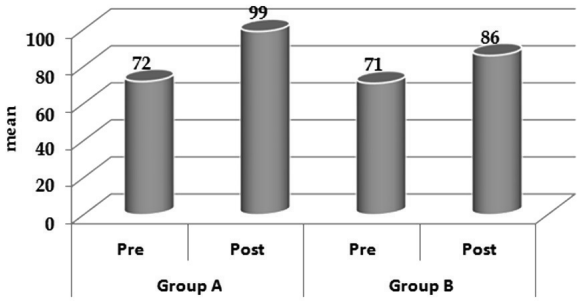
Shoulder Abduction Rom in Group A And Group B

Table 3: Mean and SD of active shoulder abduction ROM in Group A and Group B.

		Mean	Std. Deviation
Group A	Pre	72.00	18.135
	Post	99.00	18.529
Group B	Pre	71.00	11.972
	Post	86.00	12.649

The above table show pre post mean score and SD of shoulder abduction ROM. IN Group A, pre-ROM is 72±18.135 and post treatment the ROM increased to 99±18.529. In Group B, pre-ROM is 71±11.972 and post treatment the ROM increased 86±12.649.

Graph 3: Mean and SD of active shoulder abduction ROM in Group A and Group B



Pre-post comparison of active shoulder abduction rom in group a and group b.

Table 4: t value and P value of active shoulder abduction ROM in Group A and Group B

		Mean	t value	P value	Result
Group A	Pre to Post	27.00	8.487	0.000	P<0.05
Group B	Pre to Post	15.00	6.708	0.000	P<0.05

Pre post comparison shows significant improvement in ROM from pre to post in Group A and Group B.

Comparison of Active Shoulder Abduction Rom Improvement Between Group A and Group B

Table 5: t value and p value of pre post comparison in active shoulder abduction ROM

		Average improvement	t value	P value	Result
Shoulder abduction	Group A	27.00	2.979	0.008	P<0.05
	Group B	15.00			

Comparison between Groups shows p<0.05. Therefore, there is statistically significant difference between Group A and Group B. Group A's improvement is better than Group B.

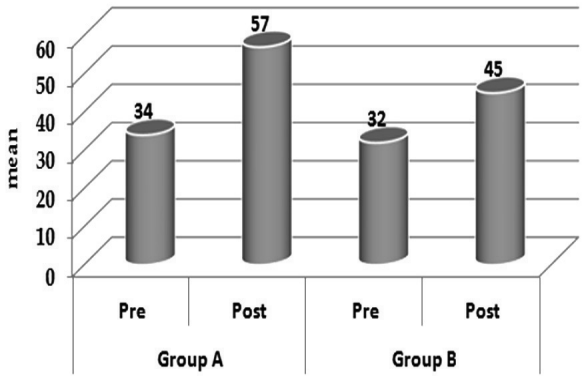
Active external rotation rom of shoulder in group A and group B

Table 6: Mean and SD of active External rotation ROM in Group A and Group B

		Mean	Std. Deviation
Group A	Pre	34.00	9.660
	Post	57.00	12.516
Group B	Pre	32.00	9.189
	Post	45.00	7.071

The above table show pre post mean score and SD of active External rotation ROM. In Group A, pre-ROM is 34 ± 9.660 and post treatment the ROM increased to 57 ± 12.516. In Group B, pre-ROM is 32 ± 9.189 and post treatment the ROM increased to 45 ± 7.071.

Graph 4: Mean and SD of Active External rotation ROM in Group A and Group B



Pre-post Comparison of Active Shoulder External Rotation rom in Group A and Group B

Table 7: Pre post comparison of active external rotation ROM in Group A and Group B

		Mean	t value	P value	Result
Group A	Pre to Post	23.00	10.371	0.000	P<0.05
Group B	Pre to Post	13.00	8.510	0.000	P<0.05

Pre post comparison shows significant improvement in ROM from pre to post in Group A and Group B.

Table 8: t value and P value of active shoulder external rotation ROM in Group A and Group B

		Average improvement	t value	P value	Result
External rotation	Group A	23.00	3.810	0.001	P<0.05
	Group B	13.00			

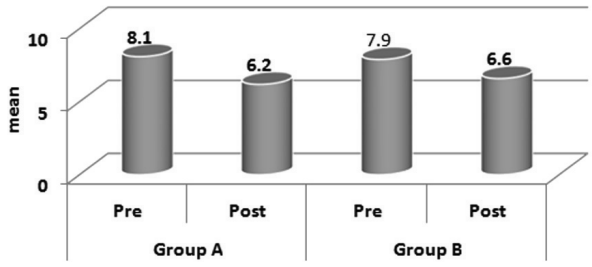
Comparison between group shows p<0.05. Therefore, there is statistically significant difference between Group A and Group B. Group A's improvement is better than Group B.

Numerical Pain Rating Scale in Group A and Group B

Table 9: Mean and SD of NPRS in Group A and Group B

		Mean	Std. Deviation
Group A	Pre	8.10	.737
	Post	6.20	1.135
Group B	Pre	7.90	.994
	Post	6.60	.843

The above table show pre post mean score and SD of NPRS. In Group A, pre-ROM is 8.1 ± 0.737 and post treatment the ROM reduced to 6.2 ± 1.135. In Group B, pre NPRS is 7.9 ± 0.994 and post treatment the ROM reduced to 6.6 ± 0.843.



Graph 5: Mean and SD of NPRS in Group A and Group B

Pre-Post Comparison of NPRS in Group A and Group B

Table 10: Pre post comparison of NPRS in Group A and Group B

		Mean	t value	P value	Result
Group A	Pre to Post	1.900	8.143	0.000	P<0.05
Group B	Pre to Post	1.300	8.510	0.000	P<0.05

Pre post comparison shows significant improvement in VAS from pre to post in Group A and Group B.

Comparison of NPRS improvement between Group A and Group B

Table 11: t value and P value of NPRS in Group A and Group B

		Average improvement	t value	P value	Result
NPRS	Group A	1.900	2.152	0.044	P<0.05
	Group B	1.300			

DISCUSSION

Comparison between groups shows p<0.05. Therefore, there is statistically significant difference between Group A and Group B.

Adhesive capsulitis is one of the most common causes of inappropriate shoulder function. This study was conducted to examine the immediate effectiveness of subscapularis positional release technique in patients with unilateral adhesive capsulitis.

In Group A, the mean shoulder abduction ROM post intervention was 99° with a difference of 27° from pre to post intervention, with a t value of 8.487 indicating that there was significant improvement in shoulder abduction ROM post intervention. The mean shoulder external rotation ROM post intervention was 57° with a difference of 18° from pre to post intervention, with a t value of 12.516 indicating that there was significant improvement in shoulder external rotation ROM post intervention. The mean NPRS post intervention was 6.20 with a difference of 1.900 from pre to post intervention, with a t value of 8.143 indicating that there was significant improvement in NPRS post intervention.

In Group B, the mean shoulder abduction ROM post intervention was 86° with a difference of 15° from pre to post intervention with a t value of 6.708 indicating that there was significant improvement in shoulder abduction ROM post intervention.

The mean shoulder external rotation ROM post intervention was 45° with a difference of 13° from pre to post intervention, which gave a t value of 8.510 indicating that there was significant improvement in shoulder external rotation ROM post intervention. The mean NPRS post intervention was 6.60 with a difference of 1.300 from pre to post intervention, which gave a t value of 8.510 indicating that there was significant improvement in NPRS post intervention.

On comparing Group A and Group B, the t value of shoulder abduction ROM was 2.979, the t value of shoulder external rotation ROM was 3.810, and the t value of NPRS was 2.152 which showed that there was significant improvement in Group A over Group B.

The possible physiology of reduction in pain and improved range of motion may be due to the following reasons, Positional Release Technique is thought to decrease tissue tenderness by altering nociceptor activity in the soft tissues. Based on previous literature and our current findings, it appears that PRT techniques have the capacity to provide immediate relief of tenderness. Also, PRT apparently begins to engage the fascial tension patterns associated with trauma, inflammation, and adhesive pathology. This process may involve an "unwinding" action in the myofascial tissue. Kerry and George concluded that the application of PRT may be effective in producing reduction of joint hypomobility. When the muscles crossing joints become hypertonic or tight, the result is joint hypomobility. By using PRT, the affected muscles and fascial tissues relax. PRT appears to affect inappropriate proprioceptive activity during this phase, thus helping to normalize tone and set the normal length-tension relationship in the muscle by elongation of the involved muscle fibers to their normal state. It also reduces fascial tension, and joint hypo-mobility and subsequently increase the ROM and decrease in pain.[26,27,28] With Capsular stretches, when tissues are stretched with a low intensity, prolonged stretch force, plastic deformation occurs, and the length of the tissue increases. The increase in range may be attributed to stretching of muscles and the capsule that becomes shortened because of decreased mobility and pain.[29]

CONCLUSION

The conclusion of this study is based on the comparison of pre post mean measures of Active Shoulder Abduction ROM, Active Shoulder External Rotation ROM, and Numerical Pain

Rating Scale within and between Group A and Group B which concluded that there is significant improvement in both the groups but participants who received subscapularis positional release technique with capsular stretches (Group A) showed more improvement than participants who received capsular stretches alone (Group B) in terms of pain. The difference was significant statistically.

As per Data analysis and interpretation and Clinical improvement, Null hypothesis is rejected, and Alternate hypothesis is accepted which states "There was significant difference in-terms of pain and range of motion among the patients who received subscapularis positional release technique along with capsular stretches and patients who received capsular stretches alone."

LIMITATIONS AND RECOMMENDATIONS

This study was conducted with 20 patients only and in future, studies with a larger sample size can be conducted for better results. This study showed the immediate effectiveness of the treatment; therefore, it is not possible to know the long-lasting effects of the treatment, for which a study of longer duration can be conducted.

IMPLICATIONS TO PRACTICE

As this study has shown significant immediate improvement in participants who received subscapularis positional release technique in terms of pain and range of motion, it can be used in the treatment protocol of adhesive capsulitis as with its immediate effectiveness, and it may also increase the patient therapist adherence and treatment adherence.

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