

# Comparative Effect of Niel-Asher Technique and Positional Release Technique on Pain, Active ROM and Functional Disability in Adhesive Capsulitis: An Experimental Study

PRABHU RAM KRISHNAPANDIAN<sup>1</sup>, DEEPAK RAGHAV<sup>2</sup>, AMIT DWIVEDI<sup>3</sup>

## ABSTRACT

**Introduction:** Adhesive Capsulitis of Shoulder (ACS) is a common self-limiting disorder characterised by painful, progressive loss of active and passive shoulder motion due to fibrosis and rigidity of the joint capsule. ACS occurs in 2-5% of the population overall and up to 20% of those with diabetes. Women between the ages of 40 and 60 are at increased risk, and one in four patients may have bilateral illness. Several studies have been done to prove the effectiveness of electro-therapeutic modalities and manual mobilisation techniques on Adhesive Capsulitis, but very few studies have been done to find out and compare the effectiveness of Niel-Asher technique and Positional Release Technique (PRT) on adhesive capsulitis.

**Aim:** To compare effect of Niel-Asher technique and positional release technique on pain, active Range of Motion (ROM) and functional disability in patients with adhesive capsulitis.

**Materials and Methods:** This was a pre and post-experimental design conducted at Santosh Medical College and Hospital, Ghaziabad, India, for a duration of two years conducted on 110 patients with a diagnosis of stage II primary adhesive capsulitis. The patients were divided into group A and group B using a systematic random sampling procedure. Conventional physiotherapy and the Niel-Asher technique were used on patients in group A. Patients in group B received conventional

physiotherapy and PRT. The therapy was given to patients, three times weekly for a total of six weeks. The Shoulder Pain and Disability Index (SPADI), Range of Motion (ROM) and Visual Analogue Scale (VAS) were measured in both groups in pre, mid and post-therapy. The analysis of the collected data was done by Statistical Package for Social Sciences (SPSS) software version 17.0.

**Results:** A total of 110 patients with adhesive capsulitis patients, 55 in each group A (mean age: 51.78±7.810 years) and group B (mean age: 52.33±7.794 years) were included in the study and the mean age of total study subjects was 52.05±7.80 years. On analysis of the collected data, statistically significant outcomes across all three measures (VAS, SPADI, and ROM) were observed with a p-value of less than 0.001. In pain, functional impairment and restricted ROM, group A, outperformed group B in this comparison.

**Conclusion:** Both conventional physiotherapy along with Niel-Asher technique group and conventional physiotherapy along with PRT group were individually effective in relieving pain and improving Range of Motion and Functional ability in patients with Adhesive capsulitis, but among these two groups, the group that received Niel-Asher technique in addition to conventional physiotherapy reported more significant improvements when compared to PRT group, in pain, range of motion and functional ability.

**Keywords:** Range of motion, Shoulder pain and disability index, Visual analog scale

## INTRODUCTION

Painful, progressive loss of active and passive shoulder motion due to fibrosis and rigidity of the joint capsule characterises ACS, a frequent self-limiting disorder [1]. Though Duplay in 1896 reported a clinical illness with the similar features to ACS and labelled it peri-arthritis scapulohumerale, the term Frozen Shoulder (FS) is credited to Codman in 1934 [2,3]. Some other names for this issue are frozen shoulder syndrome and contracture of shoulder [4,5]. Through histological and surgical procedure of frozen shoulder patients, Nevasier was the first to explain the pathology and concluded that thickening and constriction of the capsule which becomes adherent to the humeral head is the main cause of frozen shoulder [6]. Nevasier, writing in 1945, argued that the "misnomer frozen shoulder should be eliminated from the medical literature" since the word "adhesive capsulitis" more accurately characterised the disease [6].

In the general community, ACS occurs 2-5% of patients, but up to 15-20% of those with diabetes [7]. The causes of ACS have been broken down into primary (idiopathic) and secondary (intrinsic, extrinsic and systemic) categories [8,9]. Although some have described adhesive capsulitis as a self-limiting disorder that resolves

in 1-3 years [10]. Other studies states that between 20% and 50% of patients with adhesive caspultitis suffer long-term ROM deficits that may last up to 10 years [11]. Thus treating adhesive capsulitis is a real challenge to any physiotherapist or healthcare professional and an innovative novel manual therapy techniques are required to help such patients to get faster improvement with long term benefits

The clinical examination and histological aspects of this syndrome have been associated with the four phases defined by Nevasier et al., and Hannafin et al., [12,13]. The first phase, known as the painful phase, is characterised by the slow development of symptoms. Deltoid insertion discomfort and the difficulty to sleep on the afflicted side are the only symptoms that last longer than three months. In certain cases, patients may notice a little restriction in range of motion, but this is usually remedied by the use of a local anaesthetic. Confirmed by biopsies, the arthroscopic image reveals hypertrophic, vascularised synovitis devoid of adhesions and capsular contracture. The second phase is often referred to as "freezing" [14]. In this stage there is considerable loss of active and passive ROM which has persisted for three to nine months. Arthroscopic examination reveals perivascular synovitis with increased thickness. In the third phase, known as the "frozen phase",

pain is less but shoulder stiffness persist even after an year. In the end, we reach the thawing phase. Because of capsular remodelling, there is often very little discomfort and a steady increase in range of motion [14].

**Niel-Asher technique:** The Niel-Asher technique is a hands-on manual therapy approach that makes use of body's inherent healing mechanism to treat shoulder adhesive capsulitis. A five-step therapy regimen is followed to manipulate the glenohumeral joint's musculoskeletal system in a precise, planned order [15]. This technique is effective because it helps to release the adherent structures around the shoulder joint and it also stimulates a certain neural pathway at two different levels: the cortex level and the spinal reflex level [15].

**Positional release technique:** In 1955, Dr. Lawrence Jones pioneered PRT, also known as Strain Counter Strain Technique (SCST). It is an osteopathic manual therapy technique which helps to restore normal resting muscle tone [16]. In this technique the tender points in the hypertonic muscles, that causes the musculoskeletal dysfunctions are identified [16]. Then the origin and the insertion of the hypertonic muscles are approximated [16]. Analgesia, increased mobility, and resolution of musculoskeletal dysfunction may be achieved by maintaining constant pressure at the tender point and a position of comfort (ease) for 90 seconds [17]. The results are due to the inhibition of the activated muscle spindle in the hypertonic muscle, which leads to decrease in the afferent impulses to the brain and thus efferent impulses to the muscle is decreased [16]. The efferent impulses were protecting the muscle tissue from being over stretched. By interrupting this pathway the patients muscle is allowed to relax and regain a normal muscle tone.[16] Precise skill to assess and find the primary tender point is essential in PRT, since it the most important step that helps to alleviate or eliminate spasm. Spindle resetting, decreased nociceptive sensitivity, and improved circulation are hypothesised to be the underlying causes for the improvement in patients treated with PRT [17].

**Conventional physiotherapy:** Hot packs for 10 minutes, Codman's exercise, finger ladder exercises, wand exercises, active exercises, and capsular stretching are all part of the conventional physiotherapy treatment programme [18].

Hence, the study was conducted to compare the effectiveness of Niel-Asher technique and PRT on pain, Range of Motion (ROM) and functional ability in patients with adhesive capsulitis in Indian population.

## MATERIALS AND METHODS

This was a pre and postexperimental study conducted at Santosh Medical College and Hospital, Ghaziabad, India, from January 2021 to January 2023 on the subjects diagnosed as primary adhesive capsulitis. Ethical clearance was taken before the start of the study from Institutional Ethical Committee {F.NO.SU/2021/092(21)}. An informed written consent was taken from the included subjects.

**Inclusion criteria:** Subjects, within the age group of 40-65 years, diagnosed with primary adhesive capsulitis of shoulder joint based on a referral from an orthopaedician, those having limitation of passive ROM for atleast three months in gleno-humeral joint compared with unaffected side and more than 30 degrees restriction for at least two of these three movements: flexion, abduction or external rotation were included in the study.

**Exclusion criteria:** Patients with systemic illness like diabetes mellitus, thyroid disorders, rheumatoid arthritis, those with rotator cuff tears shoulder ligament injuries, malignancies in the shoulder region, subjects with neurological disorders, previous surgery or manipulation under anesthesia of the affected shoulder were excluded from the study.

**Sample size calculation:** Using N master Software with power of 80% and alpha error 5%, shoulder flexion values-98.4 degrees with

Standard Deviation (SD)-16.9 degrees, the authors arrived at the sample size as 51 per group. Since the present study is follow-up study, attrition of participants is predicted and the effective sample size has been approximated for each group as 55.

$$n = \frac{Z^2 \times SD^2}{L^2}$$

Z=95% Significance level

L=Precision level

The participants in the research were divided into two groups using the systematic random sampling approach i.e. roughly 20 to 30 primary adhesive capsulitis patients come each month. If the data was collected for 12 months, the total population size is 240 (20 patients×12 months). Since 240/110=2, 2 is the sample interval k. As a result, every second patient who meets the inclusion criteria is included in the trial and randomly assigned to either group A or group B.

## Study Procedure

The total of 110 participants included in the study were divided into group A and group B with 55 patients each. Conventional physiotherapy treatment and Niel-Asher technique were provided to group A patients for three sessions a week, for six weeks. For patients in group B, were treated with conventional physiotherapy and positional release techniques for three sessions a week, for six weeks. Using a Visual Analog Scale (VAS), shoulder pain and disability index, and goniometry, pre-test measures were made before the intervention. Mid-test was taken at the end of week 3 and post-test at week 6 for both groups of patients. The improvement in the VAS, the Shoulder Pain and Disability Index (SPADI) and the ROM of the shoulder joint at the mid-test and the post-test were compared.

**Niel-Asher technique:** In Niel-Asher technique, the patient was made to lie sideways and several deep strokes with your hand, from elbow to humeral head were applied. Apply sustained pressure over the embedded nodules or over the fibrous band which you may feel when you move upwards. Apply deep sustained pressure on the tender point over the posterior joint capsule area (teres minor). Perform circumduction of shoulder with bent elbow repeatedly several times from small to large complete circles. Release the fascia up the long head biceps tendon and move upwards only. Pause on the nodules along the tendon; these are fascial tetherings and may be inflamed. As you approach the shoulder, near biceps tendon joins the capsule, hold the trigger point for upto three minutes until it is completely pain free. In supine lying position, the middle fingers of your hand, presses deeply on the trigger point in the middle of the shoulder blade (infraspinatus) [Table/Fig-1].



[Table/Fig-1]: Procedure for Niel-Asher technique on the patient.

**Positional release technique:** Firstly, surrounding and opposing tissues were palpated to locate tender point for shoulder flexion, abduction, internal and external rotation. Then one or two finger pads were used to apply pressure over tender points. The shoulder position were adjusted with rotation to find the position of comfort. Hold the position of comfort until pain decreases significantly or ceases. The average positions hold time with pressure is 90 secs and then release the tender point or joint slowly and reassess [Table/Fig-2].



**[Table/Fig-2]:** Procedure for positional release technique on the patient.

**Conventional physiotherapy:** This technique consists of 10-minute hot packs, Codman's exercise, finger ladder exercise, wand exercise, active activity, capsular stretching and home exercises.

Pretreatment data was gathered using a VAS, goniometry measures, and the SPADI score, with follow-ups after three and six weeks.

## STATISTICAL ANALYSIS

In order to analyse the data, non parametric tests were performed. Within group, data was analysed using the Wilcoxon signed-rank test. Comparing the data from the two groups was done with the use of the Mann-Whitney U Test. Statistical Package for the Social Sciences (SPSS) software version 17.0 was used for the analysis of tabulated data.

## RESULTS

A total of 110 patients with adhesive capsulitis met the inclusion criteria, with a mean age of  $52.05 \pm 7.80$  years divided equally into group A and group B. There was no significant difference in the demographic characteristics of the participants [Table/Fig-3].

Demographic characteristics	Mean	SD	p-value
<b>Height</b>			
Group A (Neil-Asher group)	164.65	7.837	0.906
Group B (PRT group)	164.84	8.185	
<b>Weight</b>			
Group A (Neil-Asher group)	69.95	10.508	0.890
Group B (PRT group)	69.67	10.145	
<b>Body mass index</b>			
Group A (Neil-Asher group)	25.6773	2.34558	0.740
Group B (PRT group)	25.5336	2.18462	
<b>Age</b>			
Group A (Neil-Asher group)	51.78	7.810	0.715
Group A (PRT group)	52.33	7.794	

**[Table/Fig-3]:** Demographic characteristics of participants.

Group A had a mean pre-test VAS score of 6.67, whereas group B's score was 6.6. The average scores on the visual analogue scale at post-test were 2.27 and 3.51. While there was no statistically significant difference between groups A and B on the pre-test, there was a statistically significant difference ( $p$ -value  $< 0.05$ ) on the mid-test and post-test. When comparing Niel-Asher technique with positional release technique for the treatment of adhesive

capsulitis, the authors observed that the former is superior in lowering pain [Table/Fig-4].

VAS	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	6.67	0.818	6.60	0.596	0.500
Mid-test	4.62	0.707	5.02	0.561	<b>0.002</b>
Post-test	2.27	0.781	3.51	0.767	<b>&lt;0.001</b>

**[Table/Fig-4]:** Comparison of VAS scale between group A and group B (PRT). p-value in bold letters indicate statistically significant value

The mean SPADI score before treatment was 68.97 (group A) and 68.25 (group B). The average SPADI score after the exam was 43.87 and 52.05. While there was no statistically significant difference between groups A and B on the pre-test, there was a difference ( $p$ -value  $< 0.05$ ) on the mid-test and post-test. The authors observed that Niel-Asher technique, when compared to the positional release technique for the treatment of adhesive capsulitis, is more beneficial in reducing functional disability [Table/Fig-5].

SPADI	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	68.97	3.503	68.25	2.566	0.217
Mid-test	52.99	1.000	58.97	0.824	<b>&lt;0.001</b>
Post-test	43.87	1.929	52.05	0.825	<b>&lt;0.001</b>

**[Table/Fig-5]:** Comparison of SPADI Score between group A and group B.

The average range of motion in flexion, before treatment, for group A and group B was 106.55 degrees and 103.67 degrees respectively. Postintervention, the average flexion ROM was 162.91 and 138.87 degrees. While there was no statistically significant difference between groups A and B on the pre-test, there was a significant difference ( $p$ -value  $< 0.05$ ) on the mid-test and post-test.

Mean Abduction ROM at pre-test was 86.47 degrees for group A and 86.09 degrees for group B. The average post-exercise abduction range of motion was 129.53 and 110.64 degrees. While there was no statistically significant difference between Groups A and B on the Pre-Test, there was a difference ( $p$ -value  $< 0.05$ ) on the Mid-Test and Post-Test. Internal rotation range of motion was 29.24 for group A and 29.13 for group B in the pre-test. Post-testing revealed a mean Internal Rotation Range of Motion (ROM) of 51.00 degrees for Group A and 41.80 degrees for Group B. While there was no statistically significant difference between Groups A and B on the Pre-Test, there was a difference ( $p$ -value  $< 0.05$ ) on the Mid-Test and Post-Test. The average external rotation range of motion (ROM) at the pre-test was 18.00 for group A and 18.31 for group B. In a post-treatment evaluation, the average number of degrees of freedom for external rotation in group A was 57.33 and for group B, it was 41.78. While there was no statistically significant difference between groups A and B on the Pre-test, there was a difference ( $p$ -value  $< 0.05$ ) on the Mid-test and Post-test [Table/Fig-6a,b,c,d].

When comparing Niel-Asher technique with positional release technique for the treatment of adhesive capsulitis, the authors observed that the former is superior in terms of increasing shoulder flexion ROM.

ROM-Flexion of shoulder	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	106.55	9.502	103.67	8.158	0.066
Mid-test	128.93	8.686	119.18	7.609	<b>&lt;0.001</b>
Post-test	162.91	4.624	138.87	3.475	<b>&lt;0.001</b>

**[Table/Fig-6a]:** Comparison of ROM-Flexion of shoulder, between group A and group B.

ROM-Abduction of shoulder	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	86.47	5.594	86.09	5.594	0.662
Mid-test	99.58	5.466	96.44	5.993	<b>0.001</b>
Post-test	129.53	8.353	110.64	6.129	<b>&lt;0.0001</b>

**[Table/Fig-6b]:** Comparison of ROM-Abduction of shoulder, between group A (Niel-Asher) and group B (PRT).

ROM-External rotation of shoulder	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	18.00	5.164	18.31	4.929	0.623
Mid-test	35.91	5.278	26.18	5.535	<b>&lt;0.0001</b>
Post-test	57.33	8.158	41.78	5.381	<b>&lt;0.0001</b>

**[Table/Fig-6c]:** Comparison of ROM-External rotation of shoulder, between group A (Niel-Asher) and group B (PRT).

Rom-Internal rotation of shoulder	Group A		Group B		p-value
	Mean	SD	Mean	SD	
Pre-test	29.24	3.834	29.13	3.907	0.916
Mid-test	38.45	4.413	33.20	3.699	<b>&lt;0.0001</b>
Post-test	51.00	3.682	41.80	3.268	<b>&lt;0.0001</b>

**[Table/Fig-6d]:** Comparison of ROM- Internal rotation of shoulder, between group A (Niel Asher) and group B (PRT).

## DISCUSSION

Shoulder ACS, or adhesive capsulitis, is a common self-limiting disorder characterised by painful, progressive loss of active and passive shoulder motion due to fibrosis and rigidity of the joint capsule. The main objective of this study was to compare the results of the Niel-Asher technique with those of the positional release technique for the management of adhesive capsulitis of shoulder joint in Indian population. The present study findings suggest that although both the Niel-Asher technique and the positional release technique are beneficial for patients with adhesive capsulitis, the former yielded more significant improvement in terms of pain reduction, range of motion and functional ability. In this study the ROM and functional ability in Niel-Asher group was increased, which supports the results of the study conducted by Weis J et al., a randomised placebo controlled trial conducted in association with the Rheumatology Research Unit at Addenbrooke's Hospital, Cambridge, United Kingdom (UK), the Niel-Asher technique was compared to a standard physiotherapy protocol (with exercise) and placebo in the Outpatient Department [19]. These above results can be due to the effects of mobilisation techniques on joint mobility such as releasing adherent and fibrosed soft tissues, relaying of collagen, gliding of fibres causing capsular remodelling [20].

Adhesive capsulitis is characterised by inflammation and fibrosis, both of which are closely linked to the presence of cytokines. Interleukin (IL)-1a, IL-1b, tumour necrosis factor (TNF)-a, cyclooxygenase (COX)-1, and COX-2 were all found in capsular and bursal tissues of patients with adhesive capsulitis at much greater than normal levels [21]. The nervous system goes into a "holding pattern," or stiffness, in response to painful stimuli, to protect the already injured tissues from further harm. The 'holding pattern' occurs when the painful sensation is received by the central nervous system through the afferent fibres, which causes some peripheral and central somatisation [15]. In this study the ROM and functional ability in Niel-Asher group is increased, which supports the results of the study conducted by Niel-Asher S et al., [15]. The above results can be due to the effects of mobilisation techniques on muscle spindle. The muscle spindle is the main sensory unit for the sensation of joint position [22]. The function of muscle spindles has been demonstrated to be decreased with immobility. Anderson J et al., demonstrated a decrease in muscle spindle sensitivity after hind limb suspension in rats [23]. The investigators

attributed this decrease to the decrease in stiffness of the muscle-tendon complex in series with the muscle spindle. Conversely, Kaya D showed that regular training can increase the signal from the muscle spindles, which can produce plastic alterations in the central nervous system, such as strengthening of synaptic networks and/or structural alteration in the structure and numbers of networks amid neurons [24]. These repetitive and regular signals from the mechanoreceptors can produce plastic adjustments in the cortex; over time, the cortical maps of the body are altered by increasing the cortical representation of the joints, which causes enhancement of joint proprioception and joint function. Thus, alteration in the muscle spindle, due to the repeated sequence of mobilisation and movements in the Niel-Asher technique produces an alteration in the 'holding pattern.'

Most studies have demonstrated that activation of these capsuloligamentous receptors is most intense at the limits of the ROM, when both the muscle and the tendon are stretched [25,26]. These mechanoreceptors provide proprioceptive data in the form of sensory signals modulated by the activation of the peripheral mechanoreceptors in the muscles, joints and skin. These peripheral mechanoreceptors provide the central nervous system with sensory information about joint position and movement to adjust motor action [26]. In Niel-Asher technique, activation of the peripheral mechanoreceptors provide the central nervous system with sensory information about joint position and movement to adjust motor action. Thus reduced pain and disability, and increased function as observed in the present study as well.

In the present study the ROM and functional ability improved by application of positional release technique in adhesive capsulitis patients. This improvement can be attributed to neurophysiological effects as said by Jones LH, who proposed in a study that when a muscle is strained by a sudden unexpected force, its antagonist attempts to stabilise the joint, resulting in a counter strain of the muscle in a resting or shortened position. Before the antagonist is counter strained, gamma neural activity is heightened as a result of its shortened position, making the spindle more sensitive-propagating development of restriction, sustained contraction, and trigger point development [27]. The application of positional release technique relaxes the muscle-spindle mechanism of the counterstrained tissue, decreasing afferent gamma and alpha neuronal activity, thereby breaking the sustained contraction [27].

Other studies conducted on PRT also proposed that, by decreasing the tone of the muscles and facial tightness positional release therapy improves range of motion and localised blood flow [28]. They theorised that putting patients in a relaxed posture might aid in the delivery of fluids (such as blood and lymph) to the injured areas and the elimination of sensitising inflammatory mediators [29]. The neurophysiological impact is a result of the simultaneous activation of peripheral mechanoreceptors and inhibition of nociceptors [30]. The goal of positional release therapy, an indirect myofascial technique, that focuses on the neurologic component of somatic strain, is to improve a muscle's pliability by keeping the muscle in the shortened position, as opposed to stretching it, to induce relaxation [31]. On comparison in the present research, pain reduction, functional performance, range of motion in flexion, extension, adduction and rotation and, internal and external rotation all reveal statistically significant differences amongst the two techniques. Clinically Niel-Asher technique improves ROM, reduces pain and improves functional ability more effectively than PRT in adhesive capsulitis patients.

## Limitation(s)

The present study was a single-centre study done on small sample, larger sample size may provide better results.

## CONCLUSION(S)

The present study results drew the inference that when comparing the Niel-Asher technique to positional release for the treatment of adhesive capsulitis, the Niel-Asher technique resulted in a much faster rate of recovery in terms of restoring pain-free range of motion and boosting functional activity. When compared to other mobilisation techniques, application of this technique was found to be easy, gave faster results and was reproducible.

## REFERENCES

- [1] Andrew S. Neviaser, Robert J. Neviaser; Adhesive Capsulitis of the Shoulder; J Am Acad Orthop Surg. 2011;19(9):536-42.
- [2] Duplay S. Periarthritis of the glenohumeral joint in the shoulder. Rev Pract D Trav de Med. 1896;53:226.
- [3] Codman EA. The shoulder. Boston: Thomas Todd 1934.
- [4] Lundberg BJ. The frozen shoulder. Clinical and radiographical observations. The effect of manipulation under general anesthesia. Structure and glycosaminoglycan content of the joint capsule. Local bone metabolism. Acta Orthop Scand Suppl. 1969;119:01-59. <http://dx.doi.org/10.3109/ort.1969.40.suppl-119.01>.
- [5] Bunker T. Time for a new name for frozen shoulder-contracture of the shoulder. Shoulder Elbow. 2009;1(1):04-09.
- [6] Neviaser TJ. Adhesive capsulitis of the shoulder: A study of the pathological findings in periarthritis of the shoulder. J Bone Joint Surg. 1945;27(2):211-22.
- [7] Mittal P, Goel Y, Dutta S, Giri S, Verma S, Gadre S, et al. A study on prevalence of adhesive capsulitis in patients with diabetes mellitus. Journal of Current Medical Research and Opinion. 2022;5(6):1216-34.
- [8] Bunker TD, Anthony PP. The pathology of frozen shoulder. A Dupuytren-like disease. J Bone Joint Surg Br. 1995;77(5):677-83.
- [9] Huang YP, Fann CY, Chiu YH, Yen MF, Chen LS, Chen HH, et al. Association of diabetes mellitus with the risk of developing adhesive capsulitis of the shoulder: A longitudinal population-based follow-up study. Arthritis Care Res (Hoboken). 2013;65(7):1197-202. <http://dx.doi.org/10.1002/acr.21938>.
- [10] Lundberg BJ. The frozen shoulder: Clinical and radiographical observations the effect of manipulation under general anesthesia structure and glycosaminoglycan content of the joint capsule local bone metabolism. Acta Orthop Scand. 1969;119:01-59. <https://doi.org/10.3109/ort.1969.40.suppl-119.01>.
- [11] Bulgen DY, Binder AI, Hazleman BL, Dutton J, Roberts S. Frozen shoulder: A prospective clinical study with an evaluation of three treatment regimens. Ann Rheum Dis. 1984;43(3):353-60.
- [12] Neviaser RJ, Neviaser TJ. The frozen shoulder: Diagnosis and management. Clin Orthop Relat Res. 1987;223:59-64. PMID: 3652593.
- [13] Hannan JA, Dicarolo EF, Wickiewicz TL. Adhesive capsulitis: Capsular fibroplasia of the glenohumeral joint. J Shoulder Elbow Surg. 1994;3(Suppl 5):435-40.
- [14] Reeves B. The natural history of the frozen shoulder syndrome. Scand J Rheumatol. 1975;4(4):193-96.
- [15] Niel-Asher S, Hibberd S, Bentley S, Reynolds J. Adhesive capsulitis: Prospective observational multi-center study on the Niel-Asher technique (NAT). International Journal of Osteopathic Medicine. 2014;17(4):232-42.
- [16] Joshi R, Rathi M. Effect of muscle energy technique versus positional release technique on pain and functions in patients with trapezitis-a comparative study. International Journal of Science and Research. 2015;6(5):2113-15. <https://www.semanticscholar.org/paper/Effect-of-Muscle-Energy-Technique-versus-Positional-Joshi-Rathi/c303e8440a25159aff6cea0618d277db213c1c6e>.
- [17] Diwadkar P, Khatri S. Immediate effectiveness of positional release therapy in acute ankle sprain. Indian J Phys Ther. 2013;1(1):36-40. [https://www.researchgate.net/profile/Ashish-Kakkad/publication/355779770\\_Arthrogyposis\\_Multiplex\\_Congenita\\_AMC\\_A\\_case\\_report/links/617d6e32a767a03c14d1b1ab/Arthrogyposis-Multiple](https://www.researchgate.net/profile/Ashish-Kakkad/publication/355779770_Arthrogyposis_Multiplex_Congenita_AMC_A_case_report/links/617d6e32a767a03c14d1b1ab/Arthrogyposis-Multiple).
- [18] Naz SS, Amjad F, Khawar S, Arslan SA, Ahmed A. Comparative effects of active release technique and muscle energy technique on pain, range of motion and functional disability in adhesive capsulitis patients with trigger points. Biomedical Journal of Scientific & Technical Research. 2022;44(4):35697-706.
- [19] Weis JT, Niel-Asher S, Latham M, Hazleman B, Speed CA. A pilot randomised placebo controlled trial of physiotherapy and osteopathic treatment for frozen shoulder. Rheumatology. 2003;42:145-55. [https://www.researchgate.net/publication/285730231\\_Apilot\\_randomised\\_placebo\\_controlled\\_trial\\_of\\_physiotherapy\\_and\\_osteopathic\\_treatment\\_for\\_frozen\\_shoulder/citation/download](https://www.researchgate.net/publication/285730231_Apilot_randomised_placebo_controlled_trial_of_physiotherapy_and_osteopathic_treatment_for_frozen_shoulder/citation/download).
- [20] Frank C, Akeson WH, Woo SL, Amiel D, Coutts RD. Physiology and therapeutic value of passive joint motion. Clin Orthop Relat Res. 1984;(185):113-25.
- [21] Hannafin JA, Chiaia TA. Adhesive capsulitis: A treatment approach. Clinical Orthopaedics and Related Research. 2000;(372):95-109.
- [22] Mohamed AA, Yih KJ, El Sayed WH, Wanis MEA, Yamany AA. Dynamic scapular recognition exercise improves scapular upward rotation and shoulder pain and disability in patients with adhesive capsulitis: A randomized controlled trial. Journal of Manual & Manipulative Therapy. 2020;28(3):146-58.
- [23] Anderson J, Almeida-Silveira MI, Perot C. Reflex and muscular adaptations in rat soleus muscle after hindlimb suspension. J Exp Biol. 1999;202(19):2701-07.
- [24] Kaya D. Exercise and Proprioception. In: Proprioception: The Forgotten Sixth Sense. Foster City, USA: OMICS Group; 2016. p. 234-255. <https://www.semanticscholar.org/paper/Proprioception%3A-The-Forgotten-Sixth-Sense-Kaya/e22645948d2a9d2552821b614a23b636b9dfc170>.
- [25] Steinbeck J, Brüntrup J, Greshake O, Potzl W, Filler T, Liljenqvist U. Neurohistological examination of the inferior glenohumeral ligament of the shoulder. J Orthop Res. 2003;21(2):250-55.
- [26] Lephart SM, Fu FH. Proprioception and neuromuscular control in joint stability. Champaign, IL: Human Kinetics; 2000.
- [27] Jones LH. Spontaneous release by positioning. D.O. 1964;1:109-116.
- [28] D'Ambrogio KJ, Roth GB. Positional release therapy: Assessment and treatment of musculoskeletal dysfunction. J Can Chiropr Assoc. 1998;42(3):188-89.
- [29] Bailey M, Dick L. Nociceptive considerations in treating with counterstrain. J Am Osteopath Assoc. 1992;92(3):334-41.
- [30] Maitland GD. Peripheral Manipulation, Butterworth-Heinemann, 2<sup>nd</sup> edition, 1991.
- [31] Thaker S, Dave Y, Patel SR. A study to compare the effect of muscle energy technique and positional release technique on pain and cervical ROM in patients with chronic upper trapezitis. International Journal of Scientific Research. 2019;8(6):13-17. [https://www.worldwidejournals.com/international-journal-of-scientific-research-\(JSR\)/article/a-study-to-compare-the-effect-of-muscle-energy-technique-and-positional-release-technique-on](https://www.worldwidejournals.com/international-journal-of-scientific-research-(JSR)/article/a-study-to-compare-the-effect-of-muscle-energy-technique-and-positional-release-technique-on).

### PARTICULARS OF CONTRIBUTORS:

1. PhD Scholar, Department of Orthopaedics (Physiotherapy), Santosh Deemed to be University, Delhi, India.
2. Principal, Department of Physiotherapy, Santosh College of Physiotherapy, Delhi, India.
3. Professor and Head, Department of Orthopaedics, Santosh Hospital, Delhi, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Prabhu Ram Krishnapandian,  
New No.1, Plot No. 1142, Pushkar Aishwaryam, 55<sup>th</sup> Street, Korattur,  
Chennai-600080, Tamil Nadu, India.  
E-mail: prabhuramstin@gmail.com

### PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jan 25, 2023
- Manual Googling: Feb 27, 2023
- iThenticate Software: Mar 09, 2023 (14%)

### ETYMOLOGY: Author Origin

### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: Jan 24, 2023

Date of Peer Review: Feb 22, 2023

Date of Acceptance: Mar 25, 2023

Date of Publishing: Apr 01, 2023