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Original article

Study of effectiveness of scapular mobilization versus proprioceptive neuromuscular facilitation technique among subjects with adhesive capsulitis at primary care level

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Abstract:

Introduction: Physiotherapy intervention plays a crucial role in management of adhesive capsulitis at primary care level in clinical practice. Present study aimed to evaluate the effect of Scapular mobilization versus proprioceptive neuromuscular facilitation technique on pain, range of motion and disability of shoulder among subjects with adhesive capsulitis.

Materials and Methods: The 20 subjects were then randomly allocated into two groups A and B. Group A were treated with Scapular mobilization and Group B with Proprioceptive neuromuscular facilitation technique were conventional therapy been common in both the groups. The Pain, Range of motion (ROM) and functional disability was measured using a Visual Analogue Scale (VAS), universal goniometer and shoulder Pain disability index for both the group and the two groups received intervention for 3 days in a week for 4 weeks. Pre and post treatment evaluation were compared and statistically analyzed.

Results: Both the Group A and Group B demonstrated statistically significant difference in reducing pain, improving ROM and functional disability, Although Group A was superior in improving in VAS (p=0.001), shoulder abduction (p=0.001), and shoulder pain disability index (p=0.001) when compared to group B .

Conclusion: Both the group seemed to be significantly efficacious in diminishing pain, ameliorating ROM and lowering the functional disability among patients with adhesive capsulitis. However, the group who received scapular mobilization showed higher improvement. So herewith the physician should be acquainted about these outputs and the importance of physiotherapy management on adhesive capsulitis which executes at primary care level.

Keywords: adhesive capsulitis, scapular mobilization, Physiotherapy intervention

Introduction

Due to changing in overall lifestyle pattern, adhesive capsulitis is nowadays recognized as one of the major issue.(1) The adhesive capsulitis is seen to be far a lot prevalent in females than males, and also is probably to have an effect on individuals between the ages of forty and sixty-five years. (1) Despite the very fact that musculoskeletal aliment is one in all the foremost common complications among diabetic patients, though it receives very little attention. And thereby the physiotherapy is crucial in coping with musculoskeletal problem but adding further it also plays an indispensable role in managing patient with adhesive capsulitis at primary care level in clinical practice.

The patient seems unable to create a smooth coordinated movement and instead hikes the overall shoulder complex (2,3) Shoulder injuries, discomfort, and impingement occur whenever this usual scapular

pattern is disrupted. [4,5] whereas Surenkok O et al. and Pragassame et al. documented in their study that scapular mobilization to be widely use and is essentially recommended in FSCS to regain normal shoulder extensibility. Furthermore , the clinicians have given proprioceptive exercises a considerable thought when it comes in treating FS. [6] With this view, present study aimed to evaluate the effect of Scapular mobilization versus proprioceptive neuromuscular facilitation technique on pain, range of motion and disability of shoulder among subjects with adhesive capsulitis.

Material and methodology

Present comparative study was conducted in Department of Orthopaedic Physiotherapy; Pravara Institute of Medical Sciences (DU) Loni , from May 2021 to January 2022. Subjects willing to participate were provided with the participant information sheet and written informed consent before doing baseline assessment and being allocated to the group. The study was approved by the Institutional Ethics Committee. The sample size of 36 subjects was calculated at 90% confidence level.

Randomization was done using simple random sampling method, into 2 groups. Group A and B where the intervention was given for 3 days per week for 4week was given to all the participants. and post-treatment assessment was taken for pain intensity, shoulder range of motion and shoulder pain disability index.

A total of 40 subjects with Adhesive Capsulitis were selected based on the selection criteria. The 20 subjects were then randomly allocated into two groups A and B. Group A were given Scapular mobilization and Group B were given Proprioceptive neuromuscular facilitation technique were conventional therapy Pain been common in both the groups. Range of motion (ROM) and functional disability was measured using a Visual Analogue Scale (VAS), universal goniometer and shoulder Pain disability index for both the groups. The two groups received therapy for 3 days in a week for 4 weeks. Pre and post treatment evaluation were compared and statistically analyzed.

Participants diagnosed with unilateral adhesive capsulitis involvement, must be in Stage 2 to 3 , the age group of 40 to 65 years, both the gender been included ,With or Without Diabetes affection, Painful and limited glenohumeral ROM greater than 25% in atleast 2 of the following shoulder motion (flexion , abduction , external and internal rotation) shoulder on comparison to the uninvolved shoulder, having capsular pattern restriction and Participants willing to sign the written informed consent form. Exclusion criteria any Previous or recent surgical history of shoulder, Autoimmune diseases and inflammatory condition, Cervical Radiculopathy, Neurological disorder, Uncontrolled DM., Radiographs were used to exclude other shoulder conditions.

The primary outcomes were impairments (pain and shoulder ROM,) and Secondary outcomes were and functional disability. The patients rated the intensity of their pain, using a visual analogue scale that ranged from 0 (no pain) to 10 (worst imaginable pain). The visual analogue scale is a valid and reliable measure of pain intensity in adults with shoulder pain or adhesive capsulitis. A 12-inch goniometer was used to measure shoulder ROM, following standardized procedures.The secondary outcome were evaluated with Shoulder Pain and Disability index data regarding functional disability due to pain and stiffness were collected, this questionnaire consists of a self-administered instrument that measures pain and disability associated with shoulder disease. It consists of 13 items divided into 2 subscales, pain items and disability (8 items) SPADI is scored 0 to 130 by averaging the scores from the two subscales.

The study was conducted to find out the effectiveness of SM and Proprioceptive neuromuscular facilitation Technique in the participants with adhesive capsulitis. The results were analyzed on the basis of data obtained from pre- and post-intervention.

Group 'A' (Scapular mobilization + Conventional treatment)

Group 'A' participants been treated with Scapular mobilization [4,5,6,7]

Group 'B' (PNF + Conventional treatment)

Group 'B' participants will be treated with Proprioceptive neuromuscular facilitation technique.[8,9]

The analysis was done using SPSS windows 28.0.1.0(142) version. The attributable score for each outcome were normally distributed, as evaluated by

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the Shapiro Wilks Test ($p > 0.05$) as which is

Results:

A total of 57 subjects with adhesive capsulitis were screened. Of them, 17 were excluded as were not satisfying the inclusion criteria. Then 40 subjects were selected and randomly allocated to 2 groups: one group got SM and the other group got PNF where conventional treatment was given in both the groups .There were 1 drop outs in SM group (n = 19) and 2 drop (n = 18) outs in PNF group. Both the groups were homogenous with respect to age, gender, and affected extremity.

Primary analysis:

Pain and ROM, were the primary outcome measures analyzed between the 2 groups. Both the groups had similar characteristics at baseline with respect to function ..There was statistically significant difference in treatment outcome between both groups but the Scapular mobilization group demonstrated statistically significantly difference in VAS compared to Proprioceptive neuromuscular facilitation technique with mean difference of -1.181, 95 % CI [-.1.860, -.503], P = .001, with the effect size calculated by Cohen's d being 1.016. The Scapular mobilization group also demonstrated statistically demonstrated in Table 1.

significantly difference in Abduction compared to Proprioceptive neuromuscular facilitation technique with mean difference of 23.251, 95 % CI [13.761 , 32.742] , P = .<.001, with the effect size calculated by Cohen's d being 14.213.

Participants in both the groups performed all the exercises as prescribed. No adverse effects were noted.

At the end of 4 weeks (12 treatment sessions), highly significant changes were seen in the both the group in pain, and shoulder ROM Table 3.

Secondary analysis:

Functional disability related to shoulder were taken as secondary analysis. At baseline the level of functional disability was significantly different between the 2 groups (Table 3). Both the groups showed highly significant difference in functional performance after 4 weeks of intervention but the SM group also further demonstrated statistically significantly difference in SPADI compared to Proprioceptive neuromuscular facilitation technique with mean difference of -1.257, 95 % CI [-1.739, -.776], P = .<.001, with the effect size calculated by Cohen's d being .721 .

TABLE 1: DEMOGRAPHIC CHARACTERISTIC OF GROUP A AND B

Characteristics	**Group A (n = 19) Mean ± SD**		**Group B (n = 18) Mean ± SD**	
Age (years)	52.68 ± 6.055		50.72 ± 5.444	
Gender	**n**	**%**	**n**	**%**
Male	10	52.6%	7	38.8%
Female	9	47.3%	11	61.1%
Side of involvement	**n**	**%**	**n**	**%**
Right	14	73.6%	16	88.8%
Left	5	26.31 %	2	11.1%

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TABLE 2: SHOWING COMPARISON OF MEAN AND STANDARD DEVIATION INTRA GROUP.

Group	Outcome measure	Assessment	Mean ± SD
Scapular Mobilization N = 19	VAS	Pre	5.84 ±.898
		Post	2.26 ±.933
	Abduction	Pre	97.63 ± 8.85
		Post	136.47 ± 13.922
	Internal Rotation	Pre	34.37 ± 7.312
		Post	52.05 ± 5.632
	External Rotation	Pre	23.37 ± 9.287
		Post	38.37 ± 8.770
	SPADI	Pre	5.16 ± .602
		Post	2.63 ± .761
PNF N = 18	VAS	Pre	5.61 ± 1.037
		Post	3.44 ± 1.097
	Abduction	Pre	96.28 ± 11.140
		Post	113.22 ± 14.514
	Internal Rotation	Pre	35.94 ± 7.215
		Post	46.61 ± 6.757
	External rotation	Pre	20.22 ± 6.796
		Post	30.06 ± 9.490
	SPADI	Pre	5.44 ± .616
		Post	3.89 ± .676

TABLE 3: RESULTS OF PAIRED (DEPENDENT) SAMPLE T - TEST INTRA GROUP ANALYSIS

Groups	Variables	Mean ± SD	95% Confidence interval of the difference		T value	Two-sided p value
			Upper	Lower		
Scapular mobilization	VAS	3.57 ± 1.01	3.089	4.069	15.334	<.001
	Abduction	-38.8 ± 11.2	-44.28	-33.39	-14.989	<.001
	Internal Rotation	-17.6 ± 4.5	-19.870	-15.499	-16.999	<.001
	External Rotation	-15.0 ± 4.04	-16.948	-13.052	-16.178	<.001

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	SPADI	2.52 ± .697	2.191	2.862	15.806	<.001
Proprioceptive neuromuscular facilitation technique	VAS	2.16 ± .857	1.740	2.593	10.720	<.001
	Abduction	-16.9 ± 6.54	-20.201	-13.688	-10.978	<.001
	Internal Rotation	-10.6 ± 3.21	-12.267	-9.067	-14.065	<.001
	External Rotation	-9.83 ± 4.27	-11.959	-7.708	-9.762	<.001
	SPADI	1.55 ± .616	1.249	1.862	10.719	<.001

TABLE 4: VAS , ROM AND SPADI MEAN ± SD INTER GROUP

Outcome measure	**Groups**	**Assessment**	**Mean ± Sd**
VAS	Scapular Mobilization	Pre	5.84 ±.898
		Post	2.26 ± .933
	PNF	Pre	5.61 ± 1.03
		Post	3.44 ± 1.09
Abduction	Scapular Mobilization	Pre	97.63 ± 8.85
		Post	136.4 ± 13.9
	PNF	Pre	96.28 ± 11.14
		Post	113.2 ± 14.5
Internal rotation	Scapular Mobilization	Pre	34.37 ± 7.31
		Post	52.05 ± 5.63
	PNF	Pre	35.94 ± 7.21
		Post	46.6 ± 6.75
External rotation	Scapular Mobilization	Pre	23.37 ± 9.28
		Post	38.37 ± 8.77
	PNF	Pre	20.22 ± 6.79
		Post	30.06 ± 9.49

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SPADI	Scapular Mobilization	Pre	5.16 ± .602
		Post	2.63 ± .761
	PNF	Pre	5.44 ± .616
		Post	3.89 ± .676

TABLE 4: VAS, ROM AND SPADI MEAN DIFFERENCE BETWEEN GROUP ANALYSIS

Variables	Assessment	T value	P value	Mean difference	95% confidence interval difference		Cohens 'd Standardization
					Upper	Lower	
VAS	PRE	.725	.473	.231	-.415	.877	.968
	POST	-3.535	.001	-1.181	-1.860	-.503	1.016
Abduction	PRE	.410	.684	1.354	-5.345	8.052	10.031
	POST	4.974	<.001	23.251	13.761	32.742	14.213
Internal Rotation	PRE	-.660	.514	-1.576	-6.427	3.275	7.265
	POST	2.667	.012	5.442	1.299	9.584	6.204
External Rotation	PRE	1.170	.250	3.146	-2.311	8.603	8.172
	POST	2.769	.009	8.313	2.219	14.407	9.127
SPADI	PRE	-1.431	.161	-.287	-.693	.120	.609
	POST	-5.301	<.001	-1.257	-1.739	-.776	.721

Discussion

Adhesive capsulitis, also known as arthrofibrosis, is a malady in which excessive scar tissue or contractures are been produced across the glenohumeral joint, resulting in discomfort, stiffness, and malfunction leading to generalized restriction. [10,11]. The glenohumeral and scapulothoracic joints are thought to be part of a closed kinetic chain. If GH mobilization ameliorate shoulder movements and normalizes the scapula-humeral rhythm, so SM should also improve shoulder movements; and this is in line with our findings that scapular mobilization was eventually found to be effective in improving ROM and reducing pain, which is based on the mechanism of peripheral mechanoreceptor stimulation and nociceptors inhibition. The majority of these mechanoreceptors are found around synovial joints. The sensory input provided by synovial joint movement may be sufficient to engage the endogenous pain-inhibitory mechanisms. [12.13,14]

İrem Düzgün et.al , in his study founded that manual therapy involving scapular mobilization has a beneficial effect on pain, range of motion, muscular strength, and level of functional activity on frozen shoulders following standard protocol to a similar level on patients with and without diabetes, which corroborated some of the objectives of our study.[15]In two ways, end-of-range passive motions or passive mobilization can limit peripheral input to the CNS, resulting in pain reduction.

The Neurophysiological effect are such that , the small amplitude oscillatory movement induces the activation of mechanoreceptors leading to transmission of nociceptive response further to it causing stimulation of (theories of pain).The Mechanical effects are such that small amplitude movement increases synovial fluid flow, which brings nutrients to the avascular parts of the articular cartilage, reducing ischemia. The gentle joint play movement maintain the efficiency of the nutrient exchange and prevent or averts painful effects of stasis when a joint is painful and inflamed or also if can't move through vary range of motion. (However, not in cases of acute or excessive swelling). [14]

Et al Pragassame.A in her study stated that scapular mobilization was shown to be effective in enhancing shoulder Movement. [4,16,17] Also, Kershaw and Moran reported that end range mobilization combined with scapular mobilization is more effective than end range mobilization alone in reducing shoulder pain,

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and improving function and mobility. [18] The findings of this study are likwise congruent with ours, in which scapular mobilization combined with a standard protocol resulted in a considerable increase in shoulder range.

Over and above that a study conducted by S. Maarouf et al., concluded that end range mobilization combined with scapular mobilization improved patient's functional ability more significantly than passive stretching.[19] Mahendran P et al, found that after starting all of the treatment sessions, patients who were treated with a combination of joint mobilization and PNF techniques (experimental group) encountered clinically and statistically significant improvements in pain, stiffness, and increased ROM. [20].

The totality outcome of this study substantiate H Ravichandran's research findings that the Proprioceptive neuromuscular facilitation technique demonstrated a significant improvement in terms of pain relief, restoration of ROM and early return to ADL among subjects with adhesive capsulitis [8] .When a targeted muscle is optimally contracted, autogenic inhibition (or) post-isometric relaxation stimulates the Golgi tendon organs, which delivers an inhibitory input through Ib afferent nerve fibres to the inhibitory interneurons in the spinal cord. These inhibitory interneurons also restrict the same muscle's alpha motor neuron from relaxing. This mechanism explains the possibility of relaxation in the inhibitory muscle during Proprioceptive neuromuscular facilitation techniques 's during contract-relax and hold-relax methods when performed. [8,20].

From the research conducted by, J Lewis et al suggested that the diversity of proprioceptive-neuro-facilitation techniques (PNF) could optimize the efficacy of the therapy. [21] The Leung et al. propounded that a superficial heating can lead to muscle relaxation, thus easing the restriction to stretches within and around the muscle, and consequently enhancing the ROM of the glenohumeral joint.[22] In a study published by Ansari et al. evaluated the effects of ultrasound therapy combined with end range mobilization to cryotherapy and stretching for 6 days a week for 4 weeks on pain in 40 individuals with primary adhesive capsulitis. And thereforth the ultrasound when combined with end range mobilization was more effective than cryotherapy and stretching [23] whereas pande p et al. stated furthmore that PNF and mobilization combined with ultrasound is a better treatment for frozen shoulder patients, which is consistent with our findings. [9] Also, Sharick S et al, and Farah shaheen et al manifested in their study that use of therapeutic ultrasound decreases pain in frozen shoulder [25,26] .So herewith the physician should be acquainted about these outputs and the importance of physiotherapy management on adhesive capsulitis which executes at primary care level.

Conclusion

From this research work we conclude for managing adhesive capsulitis at primary care setup were eventually the technique of scapular mobilization is much more effective in terms of VAS, abduction range and SPADI when compared to proprioceptive facilitation technique .And herewith we highlighted this important aspects of therapeutic approach in managing the foremost condition at primary care. These simple , non-invasive , economical tools plays a vital role in managing frozen shoulder at primary care.

Abbreviations:

PNF technique: Proprioceptive neuromuscular facilitation technique
ROM : Range of motion
SD : Standard Deviation
SM : Scapular mobilization
VAS: Visual Analogue Scale

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