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ORIGINAL ARTICLE

Effects of Scapular Proprioceptive Neuromuscular Facilitation Technique on Scapular Dyskinesis

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ABSTRACT

Background: Scapular dyskinesis is termed as improper control of resting position and movement pattern of the scapula having connections with shoulder pain. PNF techniques are the methods of hastening the response of a neuromuscular mechanism through stimulation of proprioceptors.

Objective: To find out the effect of scapular proprioceptive neuromuscular facilitation techniques in the treatment of scapular dyskinesis.

Methodology: A randomized clinical trial was conducted comprising of 26 patients recruited from District Headquarter Hospital and Aziz Fatimah Hospital, Faisalabad. Patients were randomly allotted into 2 groups. Group A received scapular proprioceptive neuromuscular facilitation and Group B received conventional treatment group. Scapular dyskinesis was assessed through lateral scapular slide test. Visual Analogue Scale and Shoulder pain and Disability Index were used as outcome measures. The treatment was given for four weeks and there were 3 sessions per week. The data was collected at baseline and 4th week post treatment. The data was analyzed by using SPSS software version 23.

Results: Within group analysis showed that improvement was observed for pain and shoulder disability in both group A (p=0.000) and group B (p=0.000). Between group analysis revealed significant improvement in pain from 8.23 +1.48 at baseline to 4.08 + 1.60 (p=0.000) and shoulder disability from 97.46+9.19, to 97.46+9.19 (p=0.000) at 4th week post treatment in scapular PNF group.

Conclusion: Significant improvement in VAS and SPADI was observed in scapular PNF group as compared to conventional treatment.

Keywords: Scapular Dyskinesis, Proprioceptive Neuromuscular Facilitation, Shoulder Pain, Visual Analog Scale

INTRODUCTION

Scapular dyskinesis is responsible for altering the normal kinematics and position of scapula. It is a syndrome which is characterized by having objective findings, termed as SICK (S for Scapular malposition, I for inferior medial border prominence, C for Coracoid pain and malposition and K for dyskinesis of scapular motion), that indicates main features of this disease.[1]

Scapular dyskinesis is termed as improper control of resting position and movement pattern of the scapula that is clinically very important topic to discuss because of its link with the shoulder pain.[2] The causes of scapular dyskinesis may be due to number of reasons include tiredness, infliction or trauma and prognosis depends upon causative factor for specific physiological deficit.[3] In inactive young males scapular dyskinesis can occur due to change of posture. Due to disruption of scapular movements it can also cause pain in neck.[4]

Scapular dyskinesis can occur due to different shoulder issues. In scapular dyskinesis proximal and distal etiology may be identified.Weakness in the scapular muscles, lower trapezius, and serratus anterior are proximal factors. Internal joint imbalance caused by distal causes such labral tears, glenohumeral instability, and acromioclavicular separation. Proximal factors can be improved with plan of care while distal factors can be improved with surgery followed by plan of care.[5]

Scapular dyskinesia is classified in three malfunctioned arrangement by seeing the fluctuation of scapular dyskinesia connected with the remaining location of scapula. Type 1 is described by inactivity, posterior shifting or the condition where the medial border of scapula protrudes away from thorax at inferior medial scapular border of the inferior angle of scapula and during upward lifting of arm. Type 2 is described by prominence of medial aspect of scapula during movement and inactivity. Type 3 is described by exaggerated overhead movement by upward lifting and shifting of upward boarder of scapula on thorax.[6]

In scapulothoracic joint, serratus anterior (SA) is the first stabilizing muscle that have a significant function in balancing the medial aspect of scapula at rib cage & maintaining the dynamic stability of scapulothoracic movement. The serratus anterior is key muscle that lead to normal scapular movements with aspect to rib cage while arm lifting. The serratus anterior activity is closely related to arm lifting. If there is serratus anterior dysfunction it will result in abnormal movement of scapula.[7]

Proprioceptive neuromuscular facilitation technique is powerful for diminishing pain and helps to perform functional tasks easily. The best possible ability for muscles to operate is provided by proprioceptive neuromuscular facilitation techniques, specifically reciprocal activation of agonist and antagonist to the practicable range. The utilization of diagonal patterns and the application of sensory cues, notably proprioceptive, cutaneous, visual, and aural stimuli for eliciting or enhancing motor tasks, are hallmarks of this method of therapeutic exercise.[8,9]

In our surrounding we find many people suffering with scapular dyskinesis related shoulder pain and they are even being ignored in such manner. However, no study has investigated the effects of scapular proprioceptive neuromuscular facilitation exercise in scapular dyskinesia. So, the primary objective of this study was to find out the effect of scapular proprioceptive neuromuscular facilitation techniques in the treatment of scapular dyskinesis.

MATERIALS AND METHODS

A randomized clinical trial was conducted at District Headquarter Hospital (DHQ) and Aziz Fatima Hospital Faisalabad. The ethical approval was gained from the ethical committee of The University of Faisalabad prior to the initiation of study. Sample size of 26 was calculated by OpenEpi Tool by using the data from previous published literature.[10] A written consent form was signed by the participants and the data confidentiality was assured. Purposive simple random sampling technique was used for recruitment of subjects. The sample was split into two groups, each with 13 participants.

Inclusion criteria was female participants having age between 30 – 50 years, with scapular dyskinesis diagnosed through lateral scapular slide test (LSST), having painful shoulder from last 2 months. Exclusion criteria was participants having serious medical condition and had any previous shoulder surgery,

have undergone manipulation under anesthesia, with neurological deficits affecting ADLS performed by shoulder, with frozen shoulder, having cervical disorder or any pathological condition (e.g. tendonitis) and those who were unwilling to comply with the protocol.

Participants were assessed for scapular dyskinesia in line with the Kibler's method, three test positions of LLST test were used and then two groups were created at random, Group A and Group B by sealed envelope method. Group A patients were treated with scapular proprioceptive neuromuscular facilitation technique and conventional treatment. Group B patients were treated with conventional treatment only. All participants of both groups received conventional treatment (Fig 1) comprising of hot pack, TENS, stretching and strengthening exercises. For 20 minutes, the shoulder area was treated with the heat pack. For 20 minutes, traditional TENS (comfy stim) was administered to the troublesome shoulder areas. The TENS device was set to a tolerable intensity, a pulse duration of 60 s, and a frequency of 100 Hz. Stretching and strengthening exercises were given to the patients after the PT modalities. Wand and Codman pendulum stretches were included in one set of stretching exercises. With an exercise ball, a single set of strengthening exercises that included scapular elevation, adduction (posture), and scapular stability movements were also carried out, each requiring 20 repetitions.

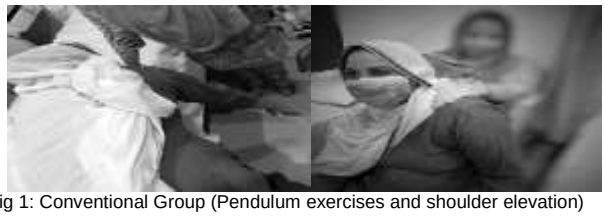

Fig 1: Conventional Group (Pendulum exercises and shoulder elevation)

Participants in Group A underwent scapular PNF (Fig 2). Therapist used two diagonals: anterior elevation and posterior depression, and anterior elevation and posterior depression. 20 repetitions were performed with a 20 second rest period in between.

When the therapist stood in the desired motion, the patient was lying on the unaffected side. The therapist first issued directions for getting ready to patient . The therapist pulled the scapula to an extended position at the start of the pattern before giving directions for the required movement. PNF agonist techniques of Rhythmic initiation and repeated contractions facilitation techniques were applied in all patterns.

Fig 2: PNF Group

Outcome measurement tools used were Visual Analogous Scale (VAS) to assess the intensity of pain and Shoulder Pain and Disability Index (SPADI) to assess pain and functional activities both. There were total twelve treatment session with three sessions per week for 4 weeks. Readings were taken at pretreatment and 4th week post treatment.

SPSS version 23 was used to tabulate and analyze the data. Age and BMI quantitative data were reported as mean+S.D. Qualitative data (dominant and affected side) was shown in the form of frequency and percentage. For comparisons across groups, the independent sample t test was employed, while the paired t test was utilized for comparisons within groups. P-value <0.05 was taken as significant.

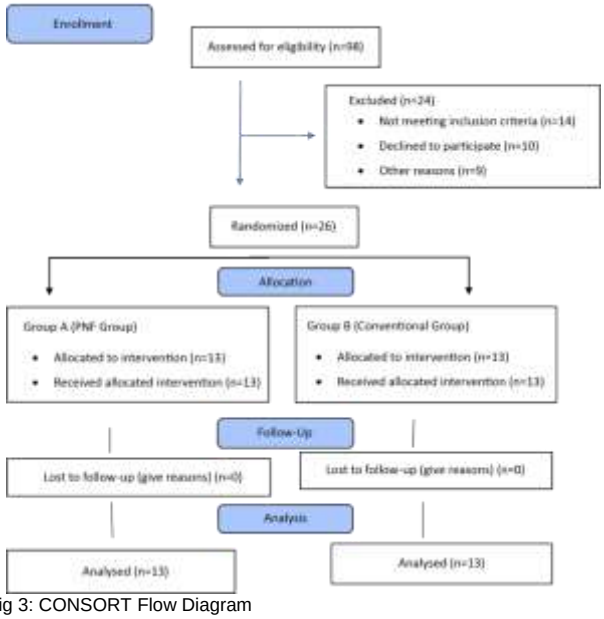

Fig 3: CONSORT Flow Diagram

RESULTS

Table 1: Demographic Data of the Study Groups

Parameters		Group A (PNF Group)	Group B (Conventional Group)
Age in Years (Mean ± SD)		38.69±5.22 years	36.80±4.54 years
Dominant Side	Right (n=21)	10 (76.9%)	11 (84.6%)
	Left (n=5)	3 (23.1%)	2 (15.4%)
Affected Side	Right (n=18)	8 (61.5%)	10 (76.9%)
	Left (n=8)	5 (38.5%)	3 (23.1%)
Body Mass Index		24.41+ 4.67	26.01 + 4.80

Table 1 displays the demographic information for both research groups. Mean ± SD of Age and BMI, and frequency of dominant side and affected side is shown in above table. There were 18 females with right side affected scapula and 8 females with left side affected scapula. There were 21 females with right side dominancy and 5 females with left dominancy. Mean age of patients in Group A was 38.69±5.22 and in Group B was 36.80±4.54. Mean BMI of patients in Group A was 24.411+ 4.667 and in Group B was 26.016 + 4.805.

Table 2: Within Group Analysis of Outcome Measures

Parameters		Pre Treatment	4th week Post Treatment	P-value
VAS	Group A (PNF Group)	8.23 +1.48	4.08 + 1.60	0.000
	Group B (Conventional Group)	8.62 + 1.44	6.46 + 1.39	0.000
SPADI (Pain Subscale)	Group A (PNF Group)	37.38 + 3.88	13.23 + 1.92	0.000
	Group B (Conventional Group)	37.92 + 3.63	29.92 + 4.53	0.000
SPADI (Disability Subscale)	Group A (PNF Group)	60.08+ 5.56	21.08 + 3.14	0.000
	Group B (Conventional Group)	60.31 + 5.58	48.46 + 6.56	0.000
SPADI (Total Score)	Group A (PNF Group)	97.46+9.19	34.31 + 5.02	0.000
	Group B (Conventional Group)	98.23 + 9.13	78.38 + 11.01	0.000

Above table shows within group analysis of VAS, SPADI Pain subscale, SPADI Disability subscale, and SPADI Total score at baseline, and 4th week post treatment.

The Mean ± SD improved significantly from baseline to 4th week with 0.000 p value for all outcome measures in Group A. Significant improvement was observed in VAS from 8.23 +1.48 at baseline to 4.08 + 1.60 (p=0.000), SPADI Pain subscale from 37.38 + 3.885 at baseline to 13.23 + 1.922 (p=0.000), SPADI Disability subscale from 60.08+ 5.560 at baseline to 21.08 + 3.148 (p=0.000), SPADI Total score from 97.461+9.197 at baseline to 34.31 + 5.023 (p=0.000) at 4th week post treatment session in scapular PNF group.

The Mean ± SD improved significantly from baseline to 4th week with 0.000 p value for all outcome measures in Group B. Significant improvement was observed in VAS from 8.62 + 1.44 at baseline to 6.46 + 1.39 (p=0.000), SPADI Pain subscale from 37.92 + 3.63 at baseline to 29.92 + 4.53 (p=0.000), SPADI Disability subscale from 60.31 + 5.58 at baseline to 48.46 + 6.56 (p=0.000), SPADI Total score from 98.23 + 9.13 at baseline to 78.38 + 11.01 (p=0.000) at 4th week post treatment session in conventional treatment group.

Table 3: Between Group Analysis of all Outcome Measures

Parameters		Group A (PNF Group)	Group B (Conventional Group)	P-value
VAS	Pre Treatment	8.23 +1.481	8.62 + 1.446	0.509
	4th week Post Treatment	4.08 + 1.605	6.46 + 1.391	0.000
SPADI (Pain Subscale)	Pre Treatment	37.38 + 3.885	37.92 + 3.639	0.718
	4th week Post Treatment	13.23 + 1.922	29.92 + 4.536	0.000
SPADI (Disability Subscale)	Pre Treatment	60.08+ 5.560	60.31 + 5.588	0.916
	4th week Post Treatment	21.08 + 3.148	48.46 + 6.565	0.000
SPADI Total Score	Pre Treatment	97.461+9.197	98.230 + 9.139	0.832
	4th week Post Treatment	34.31 + 5.023	78.38 + 11.019	0.000

Above table shows between group analysis at baseline, and at 4th week of VAS, SPADI Pain subscale, SPADI Disability subscale, and SPADI Total score. Results demonstrated no significant difference of VAS (p=0.509), SPADI Pain subscale (p=0.718), SPADI Disability subscale (p=0.916), SPADI Total score (p=0.832) at baseline between both groups with p values for all outcome measures being more than 0.05.

However, significant difference was observed in VAS, SPASI Pain subscale, SPADI Disability subscale, and SPADI Total score at 4th week post treatment session between the 2 groups with p values for all outcome measures less than 0.05.

The Mean ± SD was found significantly different at 4th week post treatment session with VAS value being 4.08 + 1.605 in Group A and 6.46 + 1.39 in Group B (p=0.000), SPADI Pain subscale value being 13.23 + 1.922 in Group A and 29.92 + 4.536 in Group B (p=0.000), SPADI Disability subscale value being 21.08 + 3.148 in Group A and 48.46 + 6.565 in Group B (p=0.000), SPADI Total score value being 34.31 + 5.023 in Group A and 78.38 + 11.019 in Group B (p=0.000).

DISCUSSION

Statistically significant difference of VAS and SPADI was observed at 4th week post treatment between the scapular PNF group and conventional therapy group. Significant improvement was observed in scapular PNF group for VAS and SPADI.

Another study by Joshi and Chitra (2017) found similar results to the current study regarding effectiveness of scapular PNF as compared to conventional treatment in improving pain, shoulder movement and upper limb function in hemiplegic patients.[11] Another study by Prasanna, et al. (2017) revealed results in line with the current study by showing significant improvement in pain, scapular dyskinesia and ROM in scapular PNF group in comparison to traditional physiotherapy in patients with adhesive capsulitis.[12]

However, a study by Balcı, et al. (2016) demonstrated findings in contrast with the current study by showing no statistically significant differences between the traditional exercise, scapular PNF, and physiotherapy modalities groups on pain, ROM, scapular dyskinesis and upper limb function in patients with adhesive capsulitis. All the three groups were found to have an immediate impact over the outcome measures with no superiority of anyone group.[10]

A review was conducted by Tedla and Sangadala (2019) to evaluate the effects of proprioceptive neuromuscular facilitation (PNF) therapy in decreasing pain and shoulder disability and enhancing range of motion (ROM) and function in adhesive capsulitis. Review findings supported the results of the present study by suggesting that the PNF group is superior to conventional physical therapy in alleviating pain and disability, enhancing shoulder range of motion, and enhancing function.[13]

A research by Mishra, et al. (2019) has agreed with the recent study findings by displaying that scapular Proprioceptive Neuromuscular Facilitation applied in conjunction with standard physical therapy activities help patients with adhesive capsulitis to experience less pain and disability.[14] Another investigation by Desai, et al. (2021) provided findings that are consistent with this recent research, where PNF approach was found more beneficial than closed kinematic chain (CKC) exercises in pain alleviation, increased scapular muscular strength, and decreased musculoskeletal problems in the upper extremities in housekeeping staff.[15]

Study limitations were that sample size was small, due to COVID-19 lockdown. So, the results can't be generalized. Another limitation was the limited availability of literature on this particular topic.

Future researchers are advised to employ a bigger sample size, conduct a triple blinded trial, evaluate more outcome measures, and treat scapular dyskinesis with a variety of treatment modalities, either alone or in combination.

CONCLUSION

Present study concluded that scapular PNF and conventional treatment both groups were found effective in improving the pain and shoulder disability in patients of Scapular Dyskinesis. But, the scapular PNF technique was found significantly better as compared to the conventional treatment in decreasing pain and enhancing shoulder function in patients with scapular dyskinesia.

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