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A randomized control trial: Role of k-cat technique with a specific exercise program in treating painful arc syndrome

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Abstract

The purpose of the study was to see how effective Kinetic Chain Activation (KCAT) with tailored exercise programme were in reducing pain and improving range of motion and functional abilities in patient with painful arc syndrome. Pre and post evaluation was performed on 25 participants using the goniometer and shoulder pain disability index (SPADI). The findings suggest a significant reduction in pain level and improvement in range of motion and functional abilities following the intervention. These data suggest that the application of kinetic chain activation technique with specific tailored exercise programme is effective intervention for treating painful arc syndrome.

Keywords: Painful arc syndrome, KCAT (kinetic chain activation technique), SPADI (shoulder pain and disability index)

Introduction

Shoulder pain is the most common and often disabling problem. It is third most common musculoskeletal problem after back and neck pain [1, 8]. It is more common in middle aged and elderly people and in certain working populations. The estimated prevalence ranges from 16-26% for a particular condition that affects individuals and can significantly affect their functional ability and quality of life. An arc between 60-120 degree of shoulder ROM is affected in the movement of abduction is painful and the pain is confined to the upper arm in the region of mid deltoid or in deltoid area and the pain may be felt at rest characteristically more at night is defined as painful arc syndrome. There are so many factor that affects the shoulder pain some are pathological, traumatic but maximum population experiencing this category of pain due to soft tissue imbalance where specifically scapular dyskinesia one of the commonest factor in non-traumatic and non-pathological shoulder arm syndrome or painful arc syndrome [1, 7, 8].

The kinetic chain model a biomechanical model used to analyse many sports activities depicts the body as a linked system of interdependent segments [2]. The sequence should be considered when attempting to restore function via a rehabilitation protocol [2]. Dynamic upper extremity dominant tasks such as throwing, hitting and serving occurs as the result of integrated sequential joint motion and muscle activation system. In order for the tasks to be effective and efficient kinetic chain must have muscle flexibility, strength, proprioception and endurance? Kinetic chain based activities have been grouped into open and closed chain. The kinetic chain activation or upper limb chain activation with k-cat concept is a brand new concept to improve functional movement. K-CAT concept is a fascial force transmission or force controlling method by the intervention of root cause analysis by either activation or deactivation of fascia, and integrating the functional movement of a natural fascial chain of the moving body. K-CAT involves finger fanning technique which helps to restore the movement in terms of efficiency and optimization in both quantity of mobility and motility. This concept and the technique proposed that in the shoulder or upper limb the distal proximity has a control over proximal [3].

Kinetic chain activation techniques have shown promise to addressing shoulder pain and improving functional ability in individuals with shoulder pain and scapular dyskinesia.

The K-CAT fingers fanning technique plays a vital role in providing dynamic stability and controlling joint forces around the shoulder joint and also have beneficial impact on pain reduction and functional improvement [3]. Previous study suggests that the strengthening programme of associated or surrounding muscle of affected area i.e. rotator cuff or scapular stabilizer and the deltoid closely envelops the GH joint and determines the silhouette of the shoulder. 6 weeks training programme of strengthening of the muscle increase the flexibility may have improve muscle function and decrease the pain [4-6].

So this study was designed to examine the effect of kinetic chain activation technique with tailored exercise programme.

Aims and objectives

To evaluate the effectiveness of kinetic chain activation in painful arc syndrome.

To evaluate the effectiveness of a specific exercise program with this above-mentioned program.

Materials and Methodology

The cross sectional research design was used in study. A cross sectional study is a sort of observational research in which data is collected at a single moment in time to evaluate the relationship between variables. The study used randomized sampling as its sample design. The participants were those who had painful arc syndrome. These people were involved in the study to see how kinetic chain activation finger fanning technique affected their condition. Paper and pencil for data recording, chair for participants to sit on during assessment and treatment, a treatment couch, Thera band, goniometer, assessment form consent form, towel for comfort or support were all used in the study.

Sample size

for this study the sample size was 25 people the individual were chosen at random from the research population to guarantee representativeness and adequate data for analysis. 5 times a week for six weeks, individuals in a clinical environment had therapy as part of the study in Pacific College of physiotherapy, Pacific Medical University (Udaipur), after obtaining ethical committee approval dated 30-12-2022, PMU/PMCH/IEC/2022/251. All participants completed information and consent form at recruitment.

Study duration

The research was carried out over a six week period. This time frame allowed for evaluation of subjects response to the therapy as well as any changes in their pain, range of motion and functional ability. Each session was scheduled for 40-45 minutes. This period was set aside to ensure the patient had enough time to execute the procedure correctly.

Procedure

Participants were treated with finger fanning technique K-CAT concept and a specific exercise regimen

Finger fanning technique

Starting position: Patient should be in relax sitting position with both feet in contact with ground, with extended elbow and flexed shoulder around 45-50 Degree of flexion which should be fully supported on the table.

Therapist position: Therapist seated in front of the patient and delivered finger fanning techniques.

Finger Fanning Technique: Therapist maneuver's the patient with his palms encapsulating patient palm, and instructs the patients to do finger fanning technique. During the fanning the resistance offered by the therapist to the patients is distributed evenly across all the fingers, and this maneuver aids in improved proximal joint mobility due to the resistance or isotonic resisted working of fingers. The proximal work isometric ally, hence results in change in length tension relationship of entire myofascial force transmission system anterolateral & posteromedial get activated.

Process: Ask the patient for finger fanning technique the palmar surface resting on the table with good contact with the below surface, if required pillow can be used for better contact.

Deltoid activation with sensory cues

Starting position: Patient should be in relax sitting position on patient stool/table with both feet in contact with ground. Therapist position-therapist should stand behind the patient

Process: Patient in sitting position therapist provides sensory cues by tapping the deltoid (k-cat concept). Ask the patient to abduct the arm and therapist should resist the movement by applying gentle pressure. Repeat for 10-15 times.

Exercise protocol and frequency of exercise

Scapular retraction with Thera Band-tie the resistance band to door handle or something stable and hold it in both ends. Ask the patient to do shoulder blades back pull the band back and let the elbows bend. Hold for 5-10 seconds and slowly let the arms come forwards, keeping both scapula back for as long as possible. (2-3 set of 10 repetitions)

Biceps curl with TheraBand step on a resistance band with one foot hold the band with same side hand, just above the thigh. Use biceps to curl the band up until it reaches to the shoulder. Lower it back and repeat. (2-3 set of 10 repetitions) Triceps extinction/press down exercise with there band-place the there band around the neck grip the one of the end loop in each hand keep the elbows and wrist straight. Straighten the arms by pushing hands down while squeezing triceps. (2-3 set of 10 repetitions) Shoulder internal rotation with there band-tie the one end of resistance band on the middle of the door or something stable object. Place a rolled up towel under the arm. keep the wrist straight bend the elbow at the side (90degree) grasp the other hand of the band across the body and forearm parallel to the ground. Hold for 5-10 seconds and slowly return. (2-3 set of 10 repetitions) Shoulder external rotation with there band-begins with the one end securely attached at waist side. Place a towel roll under the arm grasp the other end of the band with tension pull the band away from the body or away from the wall rotating the forearm outward. Hold for 5-10 seconds and return slowly. (2-3 set of 10 repetitions).

Deltoid isometrics stand while facing a wall with elbow straight. keep elbow aligned directly below the shoulder with dorsum of hand facing the wall, press forwards into the wall hold for 5-7 seconds and then release slowly(anterior

deltoid). Stand about 6 inches from the wall and body should perpendicular to the wall, make a fist a press it in to the wall, gently press into the wall and hold it there for 5-10 seconds (middle deltoid). Stand 6 inch away from the wall with back facing the wall keep the elbow straight and make a fist and gently press it into the wall. Hold the pressure against the wall for 5-10 seconds and then release slowly (posterior deltoid). (2-3 set of 5 repetitions). Diagonal pattern there a band exercise-1) stand tall and maintain good posture attach a there band above the head pull the resistance band across the body rotating the inwards and rotating the trunk away transferring the weight one leg to other hold for 5-10 seconds and return slowly. 2) Stand tall and maintain good posture. Attach the resistance band above the head. Stand sideways with your affected arm farthest away from the band. Position of arm should be across the face with palm facing backwards. Pull the band down and across the body towards the opposite hip transferring the weight from one leg to the other. Hold for 5-10 seconds then return slowly. (2-3 set of 10 repetitions).

Results

Table 1: Gender wise distribution of patients

Gender	Number of Patients	
	No.	%
Female	8	32.00%
Male	17	68.00%
Total	25	100.00%

The gender distribution among the 25 patient included in the study revealed that 8 were female accounting for 32% of the overall sample. In contrast, 17 cases were male, accounting for 68% of the overall sample.

As a result, male patient made up 68% of the study population, compared to 32% of female patients.

Table 2: Age group wise Distribution of Patients

Age group (yrs.)	Number of Patients	Percentage of Total
<31	1	4.00%
31-40	5	20.00%
41-50	4	16.00%
51-60	6	24.00%
61-70	6	24.00%
71-80	3	12.00%
Total	25	100.00%

The Study comprised 25 individuals suffering from painful arc syndrome who were subjected to kinetic chain activation (finger fanning) technique with specific exercise program. The age distribution indicated the age group of < 31 no. of patient 1, 31-40no. of patient 5, 41-50 no. of patient 4, 51-60 no. of patient 6, 61-70, no. of patient 6, 71-80 no. of patient 3, the data imply older people were more actively seeking therapy whereas middle aged group were less active.

The findings of table 3 and 4 indicate the pre-test and post test result of 25 patients who were treated with kinetic chain activation (finger fanning technique). The goniometer was used to measure range of motion of shoulder joint while the shoulder pain and disability index assessed pain and functional ability. The patient had a data of shoulder abduction range of motion pre-test mean \pm SD is 103.40 \pm 12.31 and improve to 174.32 \pm 6.19 in post-test. Regarding shoulder pain and disability score the patient had

an average value of pain component pre-test mean \pm SD is 36.16 \pm 6.34 is reduced to 12.28 \pm 3.96 in post-test. Disability component of has a pre-test value of mean \pm SD is 59.84 \pm 7.40 is reduced to 19.80 \pm 6.01 in post-test and the total score of shoulder pain and disability index value pre-test mean \pm SD is 96.00 \pm 13.13 is significantly reduced to 32.08 \pm 9.58 in post-test.

Table 3: PRE and post overall wise distribution of patients

Overall	Mean	SD
Pre Spadi (N=25)	96.00	13.13
Post Spadi (N=25)	32.08	9.58
P value	<0.001 (HS)	

Table 4: Comparison Pre & Post ROM

ROM	(N=25)	
	Mean	SD
Pre ROM	103.40	12.31
Post ROM	174.32	6.19

Overall the findings suggest that the KCAT and the specific exercise program led to a significant reduction in pain level and improve range of motion and functional abilities among the patient with painful arc syndrome. These findings and result shows potential effectiveness of this intervention in managing painful arc syndrome and enhancing functional outcomes.

Conclusion

In conclusion, this study demonstrated that kinetic chain activation technique (finger fanning) with mentioned specific exercise program effectively reduced pain, improve range of motion and functional abilities in patient with painful arc syndrome. Following the intervention there was a significant increase in shoulder range of motion levels, as evidenced by the increase ROM goniometric scores. Additionally functional ability showed a notable improvement and decrease in pain levels as indicated by the shoulder pain and disability index. Additional study with large number of sample size with more significant inclusion and exclusion criteria are needed to validate the results.

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