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RESEARCH ARTICLE

Impact of 8-Weeks Combined Cyriax Soft Tissue Release and Proprioceptive Neuromuscular Facilitation on Glenohumeral Rhythm in Post Mastectomy Adhesive Capsulitis

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ABSTRACT:

Objective: To determine the effect of Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation in improving shoulder range of motion in post mastectomy adhesive capsulitis. **Materials and methods:** This study was conducted on forty female patients who had unilateral post mastectomy adhesive capsulitis participated in this study. Their ages ranged from 35-65 years. The patients were selected from Egyptian National Cancer Institute and randomly assigned into equal two groups. Group (A) included 20 patients received Cyriax soft tissue release, Scapular Proprioceptive Neuromuscular Facilitation in addition to traditional shoulder exercises. Group (B) included 20 patients received traditional shoulder exercises. Both groups were administrated to three sessions per week for 2 months. Patients were instructed to continue exercises as a home program. The study was conducted from 1/3/2019 to 1/5/2019. Standardized goniometer was used to measure shoulder flexion and abduction range of motion as well as shoulder pain and disability index was used for pain assessment. **Results:** Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation with traditional exercises (Group A) had a significant effect in improving shoulder range of motion and decreasing pain in post mastectomy adhesive capsulitis rather than (Group B) that patients administrated to traditional shoulder exercises only. **Conclusion:** It can be concluded that Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation were valuable, effective and inexpensive combined maneuvers in increasing shoulder flexion and abduction range of motion, improving shoulder function and decreasing pain in post mastectomy adhesive capsulitis.

KEYWORDS: Cyriax soft tissue release, Scapular Proprioceptive Neuromuscular Facilitation, Mastectomy, Adhesive capsulitis.

INTRODUCTION:

The most common cancer in females is breast cancer. The management of breast cancer depends on factors such as, clinical characteristics, demographic data of the patients and the stage of the cancer. The treatment of breast Cancer in serious stages is surgical interference when the tumor is localized, then followed by chemotherapy or radiotherapy, or both. The most applied

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surgeries for breast cancer include mastectomy, quadrantectomy and lumpectomy[1-4].

Mastectomy as a common breast cancer surgery which results in limited arm/shoulder range of motion and pain. The shoulder morbidity has found to be significantly higher in females who administrated to mastectomy (17%). Shoulder joint connective tissue fibrosis appears within post mastectomy patients[5-7].

Adhesive capsulitis with shoulder sever pain in post mastectomy patients is associated with high financial costs and human sufferings. It is an idiopathic disease characterized by fibrosis, limited volume of the glenoid capsule, and massive pain with loss of range of motion (ROM). Shoulder pain and stiffness are accompanied by marked disability. Although it is believed to be a self-limiting condition which lasting 2–3 years, some studies have reported that up to 40% of cases have persistent symptoms and limited ROM beyond 3 years[8-10].

Adhesive capsulitis has a consequence of four phases; phase 1 (inflammatory): The patient complains of pain during passive and active range of motion. The pain is an ache with rest and sharp during motion and worse at night. Range of motion is still well preserved. Phase 2 (freezing): pain becomes worse with more limited ROM. This stage lasts between 3 to 9 months with an acute synovitis of the shoulder joint; Phase 3 (stiffness): limited arm usage. The stiffness phase lasts from 4 up to 12 months. The capsular pattern limits shoulder flexion, abduction and external rotation; Phase 4 (recovery): ROM begins to be enhanced and this phase lasts from 12 up to 42 months with gradual return of shoulder joint mobility[11].

The imbalance in the scapulo-humeral rhythm creates the changes in scapular alignment and interferes with ROM of upper limb which leads to reversal of rhythm[11-13].

Cyriax consisting deep transverse friction (DTF) which is known as deep friction massage (DFM), popularized by James Cyriax and has a significant effect in pain relieving. DTF is a type of connective tissue massage applied to the soft tissue structures such as tendon, muscle bellies, musculotendinous junction, ligaments and joint capsules[14].

Proprioceptive Neuromuscular Facilitation (PNF) is the therapeutic manuever that acts under the means such as stress relaxation, autogenic inhibition and pain gate theory that improves muscle firing and ROM[15].

The greatest potential for muscle fibers firing is the reciprocal activation of agonist and antagonists which included in the process of proprioceptive neuro muscular facilitation[16-18].

The aim of this work is to introduce a new combined therapy for post mastectomy adhesive capsulitis to improve shoulder range of motion and sensation of pain.

MATERIALS AND METHODS:

The study was conducted from March 2019 to May 2019 on forty female patients who had unilateral post mastectomy adhesive capsulitis participated in this study. Their ages ranged from 35-65 years. Before the study procedures, they were examined carefully by the physician. The followed procedures were in accordance with Helsinki declaration of 1975. Faculty ethical committee approval was (No: P.T.REC/017/001156).

Females enrolled to the study and signed an informed consent form before starting assessment and treatment procedures. The patients were selected from Egyptian National Cancer Institute and procedures were carried out in outpatients clinic of faculty of physical therapy, Cairo university. Patients randomly assigned into equal two groups. All patients had scapulo-thoracic and gleno-humeral changes and had no any other shoulder problems. Patients were excluded if they had ages more than 65 years or less than 35 years, another any shoulder problems as frozen, impingement and supraspinatus tendonitis or suffering from any condition for which scapular mobilization and muscle release are contraindicated as metastasis or sever osteoporosis. They were divided randomly into two equal Groups (A, B). Group (A) included 20 patients who received Cyriax soft tissue release, Scapular Proprioceptive Neuromuscular Facilitation in addition to traditional shoulder exercises such as (shoulder shrug, circles, shoulder rolls, shoulder wings, arm circles, wall exercises, forward wall crawls and side wall crawls). Three sessions per week for 24 sessions and time of treatment for each session was 45minutes. Group (B) this group included 20 patients received traditional shoulder exercises such as (shoulder shrug, circles, shoulder rolls, shoulder wings, arm circles, wall exercises, forward wall crawls and side wall crawls) 3 sessions per week for 24 sessions and time was 15 minutes for each session. Patients continued these exercises as a home program, 10 repetitions of each exercise with 5 times a day.

Standardized goniometer was used to measure shoulder flexion and abduction range of motion joint angles. It is a plastic or metal tool with 1 degree increments. The arms usually are not longer than 30 centimeters so it can be hard to accurately pinpoint the landmark needed for measuring. Shoulder pain and disability index for pain threshold evaluation[19,20].

Treatment procedures:

Cyriax soft tissue release technique: Deep Transverse Friction was administered to group (A) patients at the bicipital groove and for serratus anterior muscle. Deep friction massage was given 15 minutes per session, three times per week. DTF at Bicipital Groove for the release of anterior capsule: Patient is put in supine lying, affected side on the edge of plinth with elbow flexed at 90 degree. Therapist stands beside affected arm of the patient. Therapist thenar eminence of one hand on the anterior aspect of the treated shoulder and the other hand should hold the forearm to produce internal and external rotation. Therapist apply pressure while doing internal rotation of the shoulder joint by the other hand and pressure is released during doing external rotation. DTF for serratus anterior muscle: Patient is positioned in side lying position with affected side facing upwards. Therapist stands at the head end of the plinth. Therapist one hand passively retract the patients affected shoulder to approximate the medial border of the scapula, to create the space between the medial border and thoracic cage while the other hand therapist apply DTF in the space between the scapula and thoracic cavity[21].

Anterior shoulder capsule stretch technique : The patient stands facing the window with reachable distance in walk standing position and grasp the hand on the window bar by extending the shoulder ,after that the patient has to lunge forward and down until she feels stretching, Then Scapular PNF was applied in two diagonals, (elevation anteriorly and depression) and (posterior elevation with anterior depression) with patient positioned in normal side. In all patterns of facilitation techniques, repeated contractions as well as rhythmic initiation were applied in all patterns with resting period between 20 repetitions was 20 seconds. The rhythmic initiation technique improves active range of motion and coordination and the technique of repeated contraction increases both range of motion and muscle strength[22].

Outcome measures:

The primary outcome measure was increasing shoulder flexion and abduction and relieving pain symptoms.

Statistical analysis:

The collected data were tabulated and analyzed by using IBM SPSS version 20.0 software.

RESULTS:

1. General characteristics of patients:

Patients were assigned randomly into two equal study groups. Study group consisted of twenty female patients with mean age values of 44.25±9.21 years, control group consisted of twenty female patients with mean age, values of 43.3±9.28 years.

As indicated by the independent t-test, there were no significant differences (*P*>0.05) in the mean values of age between both tested groups (Table 1).

Table (1): Physical characteristics of patients in both groups.

	Study group Mean ± SD	Control group Mean ± SD	t-value	*P*-value	Significant level
Age (years)	44.25±9.21	43.3±9.28	0.325	0.747	NS

2. ROM of shoulder flexion:

As presented in (Table 2) and illustrated in Fig. (1), within group's comparison the mean±SD values of ROM of shoulder flexion in the "pre" and "post" tests in both groups. Multiple pairwise comparison tests (post hoc tests) revealed that there was significant increase of ROM of shoulder flexion at post-treatment in compare to pre-treatment (*P*-value=0. 000 1*).

Table (2): Mean values and p-values of ROM of shoulder flexion (degrees) pre and post test at both groups

ROM of shoulder flexion	Pre test Mean ± SD	Post test Mean ± SD	MD	*P*-value
Study group	65.5±6.46	173.75±6.04	–90.5	0.0001*
Control group	63.5±12.57	136.25±9.71	–72.75	0.0001*
MD	2.00	37.5		
P-value	0.531	0.0001*		

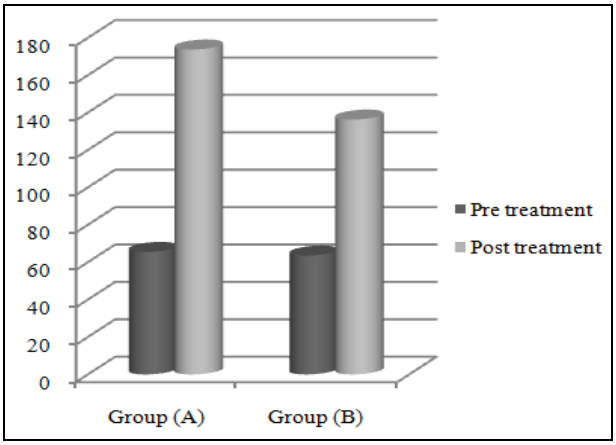

Fig. (1): Mean values of ROM of shoulder flexion (degrees) between both groups at different measuring periods.

3. ROM of shoulder abduction:

As presented in (Table 3) and illustrated in Fig. (2), within group's comparison the mean±SD values of ROM of shoulder abduction in the "pre" and "post" tests in both groups. Multiple pairwise comparison tests (post hoc tests) revealed that there was significant increase of ROM of shoulder abduction at post-treatment in compare to pre-treatment (*P*-value=0. 000 1*).

Table (3): Mean values and p-values of ROM of shoulder abduction (degrees) pre and post test at both groups.

ROM of shoulder abduction	Pre test Mean ± SD	Post test Mean ± SD	MD	*P*-value
Study group	68.5±17.85	166±10.2	-97.5	0.0001*
Control group	70.5±10.87	124±14.29	-53.5	0.0001*
MD	-2	42		
P-value	0.671	0.0001		

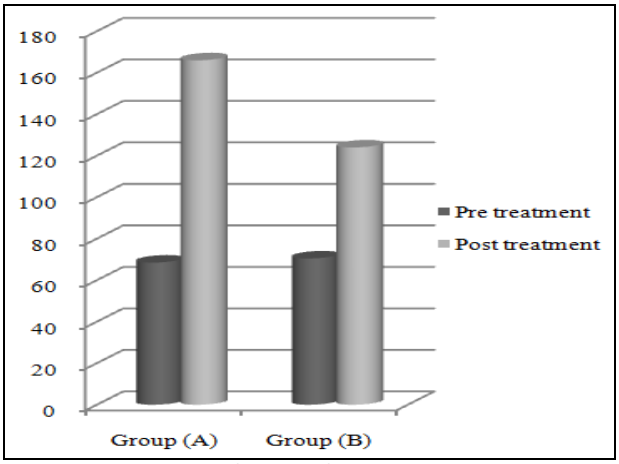

Fig. (2): Mean values of ROM of shoulder abduction (degrees) between both groups at different

4. Shoulder Pain and disability index (SPADI):

As presented in (Table 4) and illustrated in Fig. (3), Analysis of variance was used to compare difference between both the groups and differences was calculated using by unpaired t-test, $P<0.001$.

Table (4): Comparison of SPADI (pre and post) measurements of Group A and B

SPADI	Group (A) Mean ± SD	MD	Group (B) Mean ± SD	MD	*P* value
Pre	69.2±8.7	17.1	68±10.2	13.3	0.9
Post	52.1±10.9		55.6±		0.3

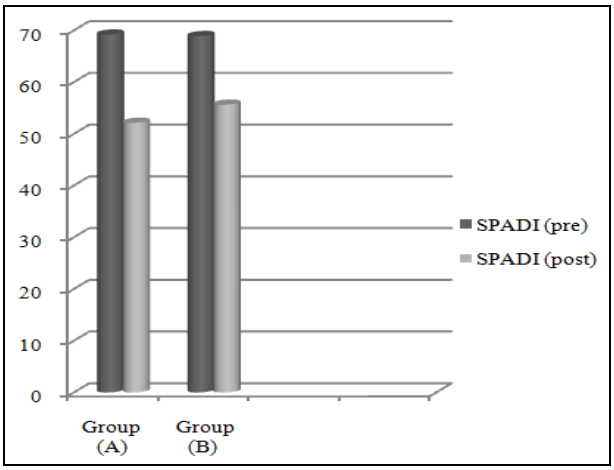

Fig. (3): Comparison of SPADI (pre and post) measurements between group A and B.

DISCUSSION:

In the present study, we evaluated the effect of Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation in improving shoulder range of motion post mastectomy adhesive capsulitis. Results showed that there was significant increase of shoulder flexion and abduction ROM and improvement of pain threshold and disability post treatment in group (A) rather than group (B). The primary finding of this study showed that SPADI and ROM were improved in response to cyriax soft tissue release and PNF. Deep transverse friction causes traumatic hyperaemia, which evacuates pain triggering metabolites. According to Cyriax technique, deep transverse friction massage regains mobility to the muscle in same way that mobilization frees a joint. Deep friction massage are intended to increase ROM on the basis of biomechanical effect which manifests itself when forces are directed towards resistance within the limits of tolerance of patient. The mechanical changes may break adhesions, realigning collagen fibers when movements stress the specific parts of the capsular tissue[23].

Many studies have proven the effectiveness of Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation in improving shoulder range of motion post mastectomy adhesive capsulitis; the study of Arora et al., (2011) mentioned that DTF could give relief of pain and help in effective connective tissue repair through stimulating phagocytosis and regenerating connective tissue as well as prevent adhesion formation. The improvements in pain scores and range of motion observed DTF and PNF group could be because of post massage analgesic effect, modulation of non-nociceptive signals at spinal cord level (Gate control theory) and inhibition of mechanoreceptors through rhythmical movements over the affected area, just closing the gate for afferents. Friction also leads to more destruction of pain provoking metabolites whose presence in high concentrations that cause ischemia and pain. Another explanation for pain relieving after prolonged DFM to a localized area could be lasting peripheral nerve disturbance with local anaesthetic effects. The range of motion in shoulder flexion and abduction improvement could be due to reduction in pain[24].

Golshan and Smith, (2006), Chalmers ,(2004) mentioned that PNF has become an effective element in reducing and preventing exercise injury due to flexibility and the increasing in blood flow, Moreover, PNF stretching enhances the accuracy of exercise and muscle firing, in addition to improving coordination. PNF based on the principle of an isometric contraction enhances the firing rate of its own muscle spindles. They in turn send stimulatory impulses to Ia-inhibitory interneurons, presumably inhibiting alpha motor neurons of the

antagonistic muscles. This leads to antagonistic muscles relaxation and/or a depression of amplitude of the muscle stretch-reflex response[25,26].

The positive effect in our study could be attributed to the nature of DTF technique, which is primarily to maximize improvement in flexibility and myofascial dysfunction. Our study demonstrated that cyriax technique and PNF were effective in reducing shoulder pain as indicated by shoulder pain and disability index (SPADI) measured after the intervention[27].

Stretching exercises given as home program were also incorporated at the end range limits helping in breaking the collagen bonds and rearrangement of the muscle fibres for permanent elongation or improved flexibility and mobility of the muscles that have adaptively shortened and become hypomobile over time[28].

On the other hand, the results of this study are inconsistent with the work reported by Maria Teresa et al.,[29] proved that there was no significant difference in shoulder joint ROM and UL function between females receiving UL exercises followed by manual therapy and those receiving UL exercises alone for rehabilitation post breast cancer surgery.

Devoogdt et al.,[30] reported that 31% of patients remained with impaired shoulder mobility. Furthermore, there is a scarcity of published data on the use of manual therapy with functional impairment.

In general, combined Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation are safe, effective, not expensive method in relieving of pain and increasing shoulder ROM of post mastectomy adhesive capsulitis.

Limitations:
Generalisation to the population cannot be made as the sample size was small.

CONCLUSION:

On the basis of the results obtaind in the present study, it can be concluded that Cyriax soft tissue release and Scapular Proprioceptive Neuromuscular Facilitation are valuable, inexpensive and effective methods in improving shoulder flexion and abduction ROM, pain threshold and disability for women suffering from post mastectomy adhesive capsulitis.

CONFLICT OF INTEREST:

All authors declare that no conflict of interest could be perceived as prejudicing the impartiality of the research reported.

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