International Journal of Community Medicine and Public Health
Makwana A et al. Int J Community Med Public Health. 2023 Nov;10(11):4187-4193
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20233449

Original Research Article

The effect of cyriax soft tissue release and myofascial release on pain pressure threshold, flexibility and muscle length in idiopathic adhesive capsulitis- a comparative study

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Received: 05 July 2023
Revised: 26 September 2023
Accepted: 02 October 2023

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ABSTRACT

Background: Adhesive capsulitis has been reported to affect 2-5% of the general population and up to 11-30% of subjects with diabetes and thyroid disease. Both myofascial release technique and cyriax soft tissue release technique are effective in patients with adhesive capsulitis. Aims and objective were to assess the effect of cyriax soft tissue release and myofascial release on pain pressure threshold, flexibility and muscle length in idiopathic adhesive capsulitis - a comparative study.
Methods: In the present comparative study, total forty-eight (48) patients with Adhesive capsulitis with age between 40-60 years were included. They were randomly divided into two groups: group-A (n=24) and group-B (n=24). Both group received conventional treatment, in addition group-A received myofascial release technique and group-B received cyriax soft tissue release technique. Patients were evaluated pre-intervention (0 week) and post-intervention (4 week) for pressure pain threshold (by means of algometer), for muscle length (by means of measure tape) and for shoulder flexibility (by means of measure tape).
Results: Result showed that there was statistically significant difference between MFR group and cyriax group in mean difference of PPT, muscle length and Apley's test during 4-week intervention period ($p<0.05$).
Conclusions: Cyriax along with conventional treatment is more effective for improving pressure pain threshold, improving muscle length and improving the flexibility of shoulder than myofascial release technique along with conventional treatment in patients with adhesive capsulitis.

Keywords: Levator scapulae, Muscle length, Myofascial release, Pain pressure threshold, Pectoralis major, Subscapularis

INTRODUCTION

The term "capsulitis" or "frozen shoulder" refers to a common shoulder condition characterized by the global restriction in the shoulder range of motion in a capsular pattern.[1] It has been reported to affect 2-5% of the general population and up to 11-30% of subjects with diabetes and thyroid disease.[2,3] Women (42%) are more affected than men (19%) with more involvement of the dominant side. It commonly occurs in the age group of 40 to 65 years.[4]

The three stages of adhesive capsulitis are as follows- The first stage that was described is called the freezing or painful stage. Pain worsens and both active and passive ROM becomes more restricted. This phase typically lasts between 3 and 9 months and is characterized by an acute synovitis of the glenohumeral joint.[5-9]

The second stage, the frozen or transitional stage. During this stage shoulder pain does not necessarily worsen. Because of pain at end ROM, use of the arm may be

limited causing muscular disuse. The frozen stage lasts anywhere 4 to 12 months.[5,9]

The third stage begins when ROM begins to improve. This 3rd stage is termed the thawing stage. This stage lasts anywhere from 12 to 42 months and is defined by a gradual return of shoulder mobility.[5] In adhesive capsulitis trigger points are seen around the shoulder joints. Myofascial trigger points are defined as tender spots exquisitely in taut bands of hardened muscle. These points are always tender which prevents full lengthening of the muscle and cause muscle weakness.[10] In frozen shoulder the trigger points are commonly seen in subscapularis, supraspinatus, pectoralis major and minor, deltoid muscle. It has also shown that patients with active trigger points have high disability and also affects the sleep quality.[11]

There are various conservative methods available for treating adhesive capsulitis including stretching, strengthening exercises, proprioceptive neuromuscular facilitation (PNF) and mobilization techniques to relieve pain and improve glenohumeral ROM. Electrotherapy modalities like ultrasound (US), interferential therapy, transcutaneous electrical nerve stimulation, short wave diathermy and LASER are also used to restore function by reducing inflammation and pain and thus allowing the re-establishment of normal shoulder mechanics.[8,12]

Myofascial release (MFR) is one of the important and powerful techniques that treat soft tissue dysfunction which removes the tightness and restriction that helps in efficient movement.[13] Deep friction massage is a specific connective tissue massage that was developed by James Cyriax. The purpose of deep friction massage is to maintain the mobility within the soft tissue structures of ligament, tendon, and muscle and prevent adherent scars from forming. There are limited literatures on the comparative effectiveness of cyriax soft tissue release versus myofascial release on pain pressure threshold, flexibility and muscle length in subjects with adhesive capsulitis. Thus, a need arises to compare their effectiveness in frozen shoulder to find out a new effective management strategy. The current study thus intends to investigate and compare the effectiveness of cyriax soft tissue release versus myofascial release of shoulder muscles on PPT, flexibility and muscle length in subjects with adhesive capsulitis.[1]

Aims and objectives

The compare the effects of cyriax soft tissue release and myofascial release on pain pressure threshold, flexibility and muscle length in patients with idiopathic adhesive capsulitis.

METHODS

It was a pre-post experimental study, study population consisted of patients with adhesive capsulitis in 40-60 years of age group. Sampling technique used was purposive sampling.

Study duration was of 1 year, 3 months from 18th November 2021 to 18th Feburary 2022.

The sample size was calculated based on pilot study using g*power software, 3.1.9.2 version, with effect size 1.14, α=0.05, power 0.95, sample size obtained was 44. Considering 10% drop outs total of 48 subjects were allocated in 2 groups randomly, 24 in each group.

Study setting was SPB physiotherapy college OPD and other clinical OPD'S of Surat.

Ethical approval was taken from institutional ethical committee of SPB Physiotherapy college.

Inclusion criteria

Following were included in the study, age group between 40-60 year, male and female both, PPT score should be >3 kg/cm, stage 1 and 2 of adhesive capsulitis.[2,14]

Following were excluded: any history of shoulder surgery in past 6 month, any history of shoulder dislocation and fracture in past 6 months, use of corticosteroid injection for shoulder in past 6 months, history of radiculopathy in upper limb, any history of rotator cuff tear, tendinitis in past 6 months, presence of calcification, presence of rheumatoid tendinous lesions, presence of any local sepsis, presence of local skin disease, stage 3 of adhesive capsulitis.

Outcome measures

PPT using pressure algometer

It was measured using an instrument called pressure algometer which was a valid and reliable tool for measuring pain intensity where sufficient pressure was applied to the preselected points at 90° angle was applied. The validity and reliability was 0.9.[14,15]

Flexibility using Apley's test

It was evaluated with Apley's scratch test. Abduction, external rotation and flexion and also adduction, internal rotation and extension were the movements performed to check the flexibility of upper limb. Dew Hurts and Bampoura found the reliability of Apley's scratch test to be greater than 0.8. Tape method was used and the data was collected in centimeters. It was measured three times and then average of three was considered.[11,16,26]

Muscle length by using tape measurement and sliding caliper method

For pectoralis major, patient lied in supine position with knees bent and low back flat on the table. The examiner

placed the subject's arm in a position of approximately 135° of abduction with elbow extended. The shoulder was in lateral rotation. If there were any tightness present, the extended arm was unable to drop down to the table level. This measurement was taken in inches using a measuring tape.[17]

For subscapularis, patient lied in supine position with low back flat on the table, arm at shoulder level (90° abduction), elbow at the edge of the table and flexed to 90° and forearm perpendicular to the table. The patient was asked to do lateral rotation of the shoulder, bringing the forearms down towards table level, parallel with the head. If the patient was unable to touch the table, the distance was measured in inches using the measuring tape.[17]

For levator scapulae, participants were standing with their arms relaxed at their sides. The subjects were asked to look directly ahead without any cranio-cervical movement.[13] The instruction was to palpate two anatomical reference points in line that represent levator scapulae length: the dorsal tubercles of the transverse processes of the second cervical vertebrae and the superior angle of the medial borders of the scapula. The assessor used a skin-marker pencil to mark the reference points. The marks were cleaned immediately after each test session. The distance between these two bony reference points was measured with a sliding caliper.[18]

Procedure

The patients were screened based on inclusion and exclusion criteria and their demographic data were taken by an assessment. Prior to the commencement of the study, detailed procedure of the study was explained to the patients and a signed informed consent form was taken from them. Then the subjects were allocated to any of the two groups by random allocation using lottery method. Description of the groups were as follows: group-A: conventional treatment + myofascial release; group-B: conventional treatment + cyriax soft tissue release.

On the first day of the first week, baseline measurements of pain pressure threshold, shoulder flexibility and muscle length and after 4th week, post intervention measurements were taken.

Conventional treatment (common to both the groups)

Prior to the manual therapy, both the groups received 15 minutes of hot packs. Grade I and II Maitland glides were given for relieving pain and spasm and for improving the range of motion), Codman pendulum exercise, finger ladder and capsular stretching (anterior, posterior and inferior) were also given.[19] Concomitant use of NSAIDS or analgesics were not permitted throughout the study.

Group A (conventional treatment + cyriax soft tissue release)[20]

Deep transverse friction was administered to the patients for pectoralis major, subscapularis and for levator scapulae muscle. The strokes used within the deep friction technique included (1) cross-fiber thumb rolling, (2) cross-fiber fingertip raking, (3) circular friction, deep friction massage was given 3 repetitions per muscle for 15-20 minutes per session, three times a week for total of four weeks.

DTF for pectoralis major muscle

Patient was positioned in the supine lying with shoulder was flexed up to 90° of abduction and approximately 30° of flexion in horizontal plane to avoid friction. The therapist lied in front of treated side and identified the coracoid process, and palpated the Pectoralis major muscle. The therapist then applied DTF to the muscle belly.

DTF at bicipital groove for subscapularis tendon

Patients were positioned in supine lying, affected side on the edge of couch with elbow flexed at 90°. Therapist stood beside the patient's treating arm. And identified the bicipital groove and palpated the subscapularis tendon. Which was medial to the inner edge of the groove. The therapist then bent his/her thumb to right angle and moved vertically up and down by applying counter pressure with other fingers at the back of the shoulder.

DTF for levator scapulae

Patients were positioned in sitting with neck in flexion and levator scapulae on active stretch. Therapist stood behind the patient. With hands on the scapula, levator scapulae muscle was palpated. The therapist then applied DTF to the muscle belly.[3]

Group B (conventional treatment + myofascial release)[20]

Patients were selected and treated with myofascial release for levator scapulae, subscapularis and pectoralis major muscle given with 3 repetitions per muscle for 15-20 minutes treatment session were given three times a week for total of four weeks.

MFR for pectoralis major

Patient were positioned in the supine lying with shoulder is flexed up to 90 degree of abduction and approximately 30° of flexion in horizontal plane to avoid friction. The therapist stood at a 45° angle to the patient. The therapist grasped the pectoralis major muscle firmly between the thumb and fingers and gently lifted and took away from the thorax and the movement can be directed towards caudal-cephalad and medial-lateral. The movement could

be a sustained movement or an oscillatory movement, depending on the patient's comfort level.

MFR for subscapularis

Patient was positioned in supine lying with shoulder abducted from 90-120°, depending upon the restriction and comfort level of the patient. The therapist stood at the 45° at the head end of the patient. One hand of the therapist grasped the patient abducted arm to provide a slight traction-distraction force in order to bring the lateral border of the scapula outward and the palm of the other hand of the therapist was placed on the lateral border of the scapula as close to the gleno-humeral joint as possible. And the thumb of the same hand moves cranio-caudally over the anterolateral border of the scapula towards the inferior angle. While placing gentle distraction on the arm, the therapist used the palm to stroke caudally and towards the inferior angle of the scapula. If fascial restrictions existed, the strokes were lengthened to include the lateral fascial sheaths between the scapula and the ilium.

MFR for levator scapulae

Patients were positioned in sitting with neck in flexion and levator scapulae on active stretch. Therapist stood behind the patient. With hands on the scapula, worked parallel to the spine by dragging down the erectors from superior to inferior.

Statistical analysis

The statistical software named statistical package of social sciences (SPSS) version 20 (SPSS 20.0) was used for the analysis of the data and Microsoft word 2007 and Excel 2007 was used to generate graphs and tables. Descriptive statistical analysis was carried out at 95% confidence interval. Outcome measurements analyzed was presented as mean±SD. Significance was assessed at 5% level of significance with p value set at 0.05; less than this was considered as statistically significant difference. Out of total 48 samples, there were 6 dropouts after 10 days of intervention i.e., 3 patients from each group. Hence, data of only 42 patients were analyzed. The data was ensured for their normal distribution using numerical (Shapiro-Wilk test) and graphical methods (normal Q-Q plots). From that, all the variables followed the normal distribution. So, the parametric tests were performed. Paired 't' test as a parametric test have been used to analyse the variables pre-intervention to post-intervention for within group calculation of change. Independent 't' test as a parametric test have been used to compare the means of variables between two groups with calculation of difference between the means.

RESULTS

Results show that when means were analyzed from pre intervention to post intervention within the groups there was a statistically significant ($p<0.05$) change in means of Apley's test, pain pressure threshold and muscle length in both the groups of myofascial release and cyriax techniques. The Table 1 and Table 2 shows that when pre-post intervention mean differences of Apley's test, PPT and muscle length were compared there was a statistically significant ($p<0.05$) within the group for group-1 and group-2 simultaneously.

Table 1: Within group-1 paired sample test (pre-post).

Group 1	Sig. (p value)	t-value
Apley's pre-post	0.000	17.219
Pectoralis PPT pre-post	0.000	-18.255
SS PPT pre-post	0.000	-14.670
LS PPT pre-post	0.000	-13.433
Pectoralis ML pre-post	0.000	-18.057
SS ML pre-post	0.000	-24.405
LS ML pre-post	0.000	-25.431

Table 2: Within group-2 paired sample test (pre-post).

Group 1	Sig. (p value)	t-value
Apley's pre-post	0.000	19.658
Pectoralis PPT pre-post	0.000	-31.121
SS PPT pre-post	0.000	-17.806
LS PPT pre-post	0.000	-31.238
Pectoralis ML pre-post	0.000	-40.988
SS ML pre-post	0.000	-29.542
LS ML pre-post	0.000	-31.353

Table 3: Mean difference values of outcome measures in group-1 and group-2.

Between group	Group 1 mean diff.	Group 2 mean diff.
Apleys test	13.92	12.88
Pectoralis PPT	-0.54	-0.99
Subscapularis PPT	-0.56	-0.77
Levator PPT	-0.42	-1.04
Pectoralis ML	-0.34	-1.20
Subscapularis ML	-0.64	-0.94
Levator ML	-0.64	-0.95

Table 4: Independent t-test between the group of all the outcome measures.

	T	Sig. 2-tailed	Mean difference
Apley's test	1.166	0.25	1.03
Pectoralis PPT	10.35	0.00	0.45
Subscapularis PPT	3.59	0.001	0.20
Levator scapulae PPT	13.54	0.00	0.62
Pectoralis ML	24.56	0.00	0.85
Subscapularis ML	6.58	0.00	0.26
Levator scapulae ML	7.78	0.00	0.30

Table 3 showed the post-intervention mean differences of Apley's test, PPT and ML for between groups. Table 4 depicts independent t-test between the group of all the outcome measures.

DISCUSSION

Frozen shoulder is a common problem within our society affecting individual's physical and social functioning considerably interfering with sufferer's daily activities. This study was conducted to compare two soft tissue release techniques on pectoralis major, subscapularis and levator scapulae. In this study, myofascial release technique and deep friction massage also known as cyriax technique has been used to fulfil the aim of the study i.e., to compare the effectiveness of both the techniques in the patients with this condition.

The reason for improvement in MFR group may be justified as, the patho-mechanics of MFR works as, under a small amount of pressure (applied by a therapist's hands) fascia will soften and begin to release when the pressure sustained over time. Frequently there is increased pain for several hours to a day after treatment, followed by remarkable improvement. It is felt that release of tight tissues accompanied by release of trapped metabolic waste products in the surrounding tissue and blood stream. The longer the problem has been present, generally the longer it will take to resolve the problem.[21]

The reason for improvement in cyriax group may be Justified as, deep transverse friction when applied in earlier repair cycle, enhances remodelling and hence reorientation of the collagen fibers in a longitudinal manner.[22] It helps in preventing adhesion formation. In situations where adhesions were already formed a more intense friction can help to break them as well. In such case, friction was used to mobilize the scar tissue and break the cross linkages between the connective tissues and surrounding structures. The intensity of the pressure applied during DFM is important to effect pain relief.[23]

Based on the statistical analysis, both group A and B showed a drastic improvement in PPT, muscle length and Apley's test and it has also shown significant improvement clinically in pressure pain threshold, muscle length and flexibility. The subjects in group-A who received cyriax and conventional treatment showed better improvement than the subjects in group-B who received myofascial release and conventional treatment when comparing mean difference of intervention both the groups at the end of four weeks

From the current study, it can be concluded that deep friction massage can be a better choice of treatment in patients of adhesive capsulitis who already have limited ROM and muscle lengths has been shortened. According the Stearn's connective tissue theory, she observed the fibroblastic activity in the healing of connective tissue as well as possible scar formation, as related to effect of movement. Her conclusions were that fibrils form almost immediately and that external factors were responsible for the development of an orderly arrangement of the fibrils. Cyriax and Russell contend that "gentle passive movements do not detach fibrils from their proper formation at the healing breach, but prevent their continued adherence at abnormal sites.[24,25]

Similarly, Gurudut et al did a study of myofascial release technique on trigger points and mobility in subjects with frozen shoulder and found on the basis of result that, the addition of MFR treatment along with conventional treatment will have more benefits and faster recovery in patients with frozen shoulder. Hence, myofascial release improved the mobility and function in the subjects. This suggest that, MFR is effective as well to release soft tissues in frozen shoulder.[11]

The purpose of deep friction massage also known as DTR technique of cyriax is to maintain the mobility within the soft tissue structures of ligament, tendon, and muscle, and prevent adherent scars from forming. Stasipolous and Johnson stated in one study in which they performed cyriax in lateral epicondylitis patients that, the massage is deep as the name implies, and must be applied transversely to the specific tissue involved unlike the superficial massage given in the longitudinal direction parallel to the vessels which enhances circulation and return of fluids. Before DFM could be performed successfully, the correct structure must be found through proper evaluation procedures. The distinction must be made between contractile structures such as the muscle belly, musculo-tendinous junction, tendon, and tendon-periosteal junction and non-contractile structures such as the joint capsule, burse, fascia, and ligament.[26]

Hence, the results of this study shows that cyriax soft tissue release technique works best for adhesive capsulitis than myofascial release technique which only works on the superficial soft tissues and not on deeper levels of connective tissues.

Following are the limitations in the study that should be considered when designing future trials: there are many muscles that are affected in adhesive capsulitis and only 3 muscles were included in the study. Another significant methodological issue that has been recognized as a possible source of measurement errors was the amount of pressure exerted through algometer as maintaining a constant pressure rate reported as the most challenging aspect of algometer.

Future scope

The present study is innovative as it assessed comparatively the effect of two novel therapeutic applications such as The myofascial release and cyriax technique alongside with the conventional method. Moreover, the present study also assessed muscle length, which was the area that has been poorly studied. This

study could have included all the muscles that are affected by adhesive capsulitis to broaden the knowledge on which outcome measures were improved post-intervention

CONCLUSION

Cyriax soft tissue release technique along with conventional treatment is more effective for improving pressure pain threshold, improving muscle length and improving the flexibility of shoulder than myofascial release technique along with conventional treatment in patients with adhesive capsulitis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Makwana A, Mishra N. The effect of cyriax soft tissue release and myofascial release on pain pressure threshold, flexibility and muscle length in idiopathic adhesive capsulitis- a comparative study. Int J Community Med Public Health 2023;10:4187-93.