



Effect of Cyriax Deep Friction Massage Versus Cryotherapy in Stage 1 & 2 of Adhesive Capsulitis: A Randomized Controlled Trial

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i57A33966

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/78849>

Original Research Article

Received 10 October 2021
Accepted 12 December 2021
Published 14 December 2021

ABSTRACT

Background: Adhesive capsulitis is one of the common pathologies of the Shoulder. The prevalence of adhesive capsulitis is estimated to be 2% to 5% of the general population. Several treatment techniques are existing for the improvement of adhesive capsulitis and Cyriax deep friction massage is a technique designed to improve adhesive capsulitis.

Objective: To compare between the effects of Cyriax deep friction massage and conventional physical therapy with Cryotherapy and conventional physical therapy in stage 1 &2 of adhesive capsulitis.

Methods/ Design: The study is a randomized controlled trial which included 34 subjects of the age group 40-85 years and were randomly assigned into two groups: group A (n=17) and group B (n=17). The Group A was given Cyriax deep friction massage with conventional physical therapy while group B was given Cryotherapy therapy with conventional physical therapy. Outcome measure were taken at baseline, and then taken on last day of sixth session by using Visual Analogue Scale (VAS), Range of Motion (ROM), and Shoulder Pain and Disability Index (SPADI). The treatment was given for 6 sessions over a period of two weeks.

Results: Group A showed greater improvement after 2 weeks of intervention with a statistical significance value for SPADI, VAS and ROM.

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Conclusion: Cyriax deep friction massage with conventional physical therapy has significant effect on pain, range of motion and functional activity in patients with adhesive capsulitis.

Trial registration: prospectively registered in the clinical trial registry-India in the registration number of CTRI/2019/09/021375.

Keywords: Cold therapy; frozen shoulder; peri arthritic shoulder; soft tissue massage.

1. INTRODUCTION

Adhesive capsulitis is one of shoulder's most severe pathologies [1]. Duplay in 1872 was the first to describe frozen shoulder as Periarthritis. Codman in 1934 coined the term "Frozen shoulder." The term "adhesive capsulitis" was proposed by J.S. Naviaser in 1945 [2].

Adhesive capsulitis is defined as "a condition of uncertain etiology, characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of a known intrinsic shoulder disorder" [3].

The prevalence of adhesive capsulitis is estimated to be 2% to 5% of the general population. In patients with diabetes and thyroid disease, prevalence may increase up to 10% - 38%. Primary adhesive capsulitis most commonly affects individuals between 40 and 65 years of age and females have a higher incidence than males. Adhesive Capsulitis occurrence in one shoulder may increase the risk of shoulder involvement in contralateral side by 5% to 34%, and simultaneous bilateral shoulder involvement may occur as often as 14% of the time [4]. The movements of the shoulder are limited by capsular adhesions, contraction of soft tissues and an adherent axillary recess which hinder the humeral head mobility [5].

Patients with adhesive Capsulitis have symptoms that include severe pain which usually worsens at night, shoulder stiffness which is insidious in nature and partial or total loss of active and passive external rotation more limited than abduction and more limited than internal rotation. 3, 5 There are no relevant results in the history of patient, clinical evaluation or radiographic examination that can explain the lack of movement or pain [3].

Adhesive Capsulitis can be either primary or secondary. Primary idiopathic adhesive capsulitis is often associated with other illness and conditions such as diabetes mellitus, patients suffering from chronic illnesses such as thyroid diseases and Parkinson's diseases are also considered to present a greater risk. Secondary

adhesive capsulitis is associated with injury or immobilisation of the shoulder (e.g., subacromial impingement, tendon tear of rotator cuff, biceps tenosynovitis, and calcium tendonitis) leading to discomfort and reduced movement in that shoulder [3].

J.S. Naviaser, divided adhesive capsulitis into four stages. Pre-adhesive phase (0-3 months) where pain presents during both active and passive movements, freezing stage (3-9 months) where high level of pain presents during the end range of movement, the Frozen stage (9-15 months) where pain is minimum with reduced joint range of motion at extreme level, and Thawing stage (15-24 months) where there is gradual and spontaneous recovery of shoulder mobility and function [6].

Many treatments have been employed in the management of adhesive capsulitis. Analgesics, corticosteroid injection, and anti-inflammatory drugs are the main medical interventions for pain management [7]. In chronic cases of restriction, arthrographic distention, surgical capsular release or manipulations under anesthetic have been endorsed [8]. The focus of physiotherapy is to reduce pain, improve range of motion and strengthen weakened muscle and eventually prevent and treat functional impairment. Different physiotherapy treatments for adhesive capsulitis include pendulum exercises, active and passive stretching, muscle strengthening exercises, resisted exercises and joint mobilizations [7].

Cyriax deep friction massage is one of the most important manipulative techniques, which was introduced by James Cyriax and Russel. On the other hand, it is a technique mostly used by the physical therapist for soft tissue injuries affecting muscle, ligament, and tendon. Cyriax rationale and principle for maintaining the mobility within connective tissue structures of ligament, tendon, and muscle by preventing from adherent scar formation [9]. Cyriax was found to be effective in supraspinatus tendonitis and tennis elbow [10,11].

Cryotherapy is a form of thermotherapy that helps in reduction of pain, inflammation, edema,

tissue temperature, metabolism, muscle stiffness, and nerve conduction velocity by reducing the temperature of the underlying tissue by withdrawing heat from the body causing an analgesic effect. Cooling agents are the first-aid step after any trauma and are used in the rehabilitation of musculoskeletal and neuromuscular dysfunction. Cryotherapy primary goal is to reduce the total amount of tissue damage, muscle spasm, swelling, and pain to reduce disability and helps in functional activity [12,13]. Cryotherapy was found to be effective in shoulder impingement, rotator cuff tendinopathy, and low back pain [12,14,15]. However the comparison between these two techniques has not been conducted in adhesive capsulitis till date. Thus, the present study was designed to determine which intervention is better in managing symptoms in adhesive capsulitis so that it will guide physiotherapists in conveniently choosing a treatment for patients with adhesive capsulitis.

2. METHODOLOGY

The study was conducted between March 2019 to February 2020 in the department of physiotherapy, in a tertiary hospital of Mangalore, India. Patients diagnosed with adhesive capsulitis by the Orthopaedician were recruited from Justice K. S. Hegde Charitable Hospital Mangalore and were screened based on inclusion and exclusion criteria. The aim of the study was clarified, and documented consent of the subjects being screened was obtained. The subjects were randomly allocated by block randomization with opaque sealed envelope into two groups: Group A (Cyriax deep friction massage with conventional physical therapy

intervention) and Group B (Cryotherapy with conventional physical therapy intervention). Outcome measure were taken at baseline, and then taken on the sixth session using Visual Analogue Scale (VAS), Range of Motion (ROM) and Shoulder Pain and Disability Index (SPADI). A previous study found cryotherapy was effective in painful shoulder after 6 treatment sessions.[12] Therefore, in the present study the participants were treated for 6 sessions over a period of two weeks under the supervision of the therapist.

2.1 Group A: Cyriax Deep Friction Massage

Participants in this group received conventional physiotherapy treatment, these are active assisted ROM exercise (Codman pendulum exercises, shoulder wheel exercise, finger ladder exercise, overhead pulley exercise, wall finger climbing), strengthening exercises, scapular stabilization exercises.2 Exercise protocol was done for 3 sets with 10-repetitions and shoulder joint capsule stretching done for 4 times with the holding time of 15-second. Followed by subjects in this group received Cyriax manipulation (deep friction massage) based on Cyriax principal. The patient was made to sit upright on chair. The therapist used his index finger reinforced by the middle finger and used short strokes (<2 cm) to move the of the relevant structures back and forth. The friction was applied by to and fro horizontal movement of the hand along the sagittal plane at a rate of one to two cycles per second for the duration of two minutes. Cyriax deep friction massage was also given for supraspinatus, infraspinatus and subscapularis (Fig. 1, 2, 3) [16].



Fig. 1. Cyriax deep friction massage for supraspinatus muscle



Fig. 2. Cyriax deep friction massage for infraspinatus muscle



Fig. 3. Cyriax deep friction massage for subscapularis muscle

2.2 Group B: Cryotherapy

Participants in this group received cryotherapy along with the conventional physiotherapy treatment (Fig. 3). In this treatment, two cold packs were used which contained silica. The temperature of the cold pack was maintained at -5°C . The position of the patient was maintained in supine lying. Clothing was removed from the shoulder region and cold pack wrapped in a damp towel was placed on participant's shoulder. One cold pack was placed over the anterior aspect of the shoulder, and other over the posterior part of the shoulder. Cryotherapy was given for total 20 minutes [12].

Duration of the treatment session in both the groups was for 45 minutes per session. Outcome

measures were re-evaluated and pre and post scores were compared.

2.3 Statistical Analysis

SPSS software 16.0 was used to calculate the data obtained. Chi square test has been used to test gender homogeneity by group. The obtained p value was > 0.05 and hence gender was equally distributed according to groups. Independent sample t test was used to compare the pre and post measurements for VAS, SPADI and shoulder ROM. Within the group comparison was analyzed by using paired t test. The p-value less than 0.05, was considered significant for the study.

3. RESULTS

The flow of participants is shown in the flowchart given below (Fig. 5). Independent sample "t" test was used to assess the homogeneity of baseline characteristics based on a group. The obtained p values are > 0.05 for most the characteristics, and hence there exists a homogeneity between groups and baseline characteristics other than SPADI. Paired "t" test was used to compare all outcome measures for each group. The obtained

p values are < 0.05 for all comparisons and hence there was a difference in outcome measures before and after interventions, for each group (Table 1). Independent sample "t" test was used to find the difference in effectiveness (pre – post) of intervention on each outcome between the groups. The obtained p values are < 0.05 for all the comparison and hence there was a difference in the effectiveness between the groups (Table 2).



Fig. 4. Illustration of Cryotherapy

Table 1. Comparison of the outcome measures for each group

		Group A		Group B			
		Mean	S.D.	p value	Mean	S.D.	p value
VAS	Pre	5.74	1.06	< 0.001*	5.12	0.928	< 0.001*
	Post	2.68	0.98		3.32	0.847	
SPADI	Pre	45.71	8.03	< 0.001*	38.76	5.403	< 0.001*
	Post	32.53	6.36		35.29	5.241	
FLEXION	Pre	114.71	23.01	< 0.001*	129.12	23.864	< 0.001*
AROM	Post	144.47	16.43		146	20.77	
FLEXION	Pre	119.71	23.01	< 0.001*	134.12	23.864	< 0.001*
PROM	Post	149.41	16.38		150.88	20.709	
ABDUCTION	Pre	99.71	14.63	< 0.001*	109.41	17.667	< 0.001*
AROM	Post	129.12	14.50		126.65	18.638	
ABDUCTION	Pre	104.71	14.63	< 0.001*	114.41	17.667	< 0.001*
PROM	Post	134.12	14.50		131.59	18.568	
EXT ROTATION	Pre	144.47	16.43	< 0.001*	146	20.77	< 0.001*
AROM	Post	66.47	6.06		62.06	8.757	
EXT ROTATION	Pre	149.41	16.38	< 0.001*	150.88	20.709	< 0.001*
PROM	Post	71.47	6.06		66.76	8.828	

VAS: Visual Analogue Scale, SPADI: Shoulder Pain and Disability Index; PROM: Passive Range of Motion; AROM: Active Range of motion; p<0.05: * Significant

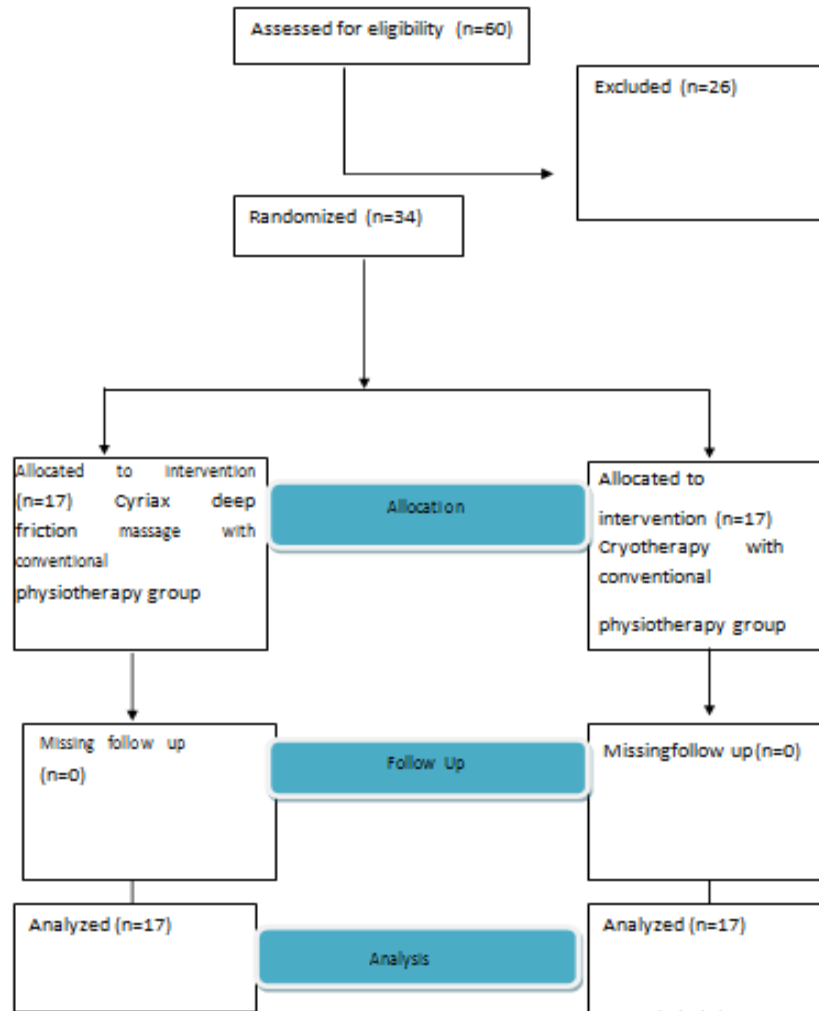


Fig. 5. Participant's flow

Table 2. Between group comparison of the effectiveness (Pre – post) of outcome measures

		Mean(difference)	S.D(difference)	p value
VAS	Group A	3.06	0.92	>0.05
	Group B	1.79	0.59	
SPADI	Group A	13.18	2.29	<0.05*
	Group B	3.47	1.28	
FLEXION AROM	Group A	29.76	10.23	>0.05
	Group B	16.88	7.60	
FLEXION PROM	Group A	29.71	10.38	>0.05
	Group B	16.76	7.69	
ABDUCTION AROM	Group A	29.41	9.33	>0.05
	Group B	17.24	8.36	
ABDUCTION PROM	Group A	29.41	9.33	>0.05
	Group B	17.18	8.40	
EXT ROTATION AROM	Group A	17.35	5.89	>0.05
	Group B	11.47	4.89	
EXT ROTATION PROM	Group A	17.41	5.82	>0.05
	Group B	11.18	5.16	

VAS: Visual Analogue Scale, SPADI: Shoulder Pain and Disability Index; PROM: Passive Range of Motion; AROM: Active Range of motion; p<0.05: * Significant

4. DISCUSSION

The study aimed to evaluate the Cyriax deep friction massage and cryotherapy given with conventional physical therapy in stage 1&2 adhesive capsulitis with respect to pain, range of motion and functional activity.

The result of the current study proposes that, both groups produced statistically significant result on comparison of the pre-post values on VAS, SPADI, and Range of motion within each group. On comparison between the two groups, Cyriax deep friction massage group revealed slightly better results in improving pain, functional activity, and range of motion. However, no statistically significant differences were seen between the two groups.

Our findings correlate with the study conducted by Fusan Guler-Ulser .et al (2004) to evaluate early reaction in adhesive capsulitis with two separate treatment approaches between mobilization exercise and physical therapy and Cyriax of deep friction massage. The outcome measures used by the study was VAS and SPADI. This study demonstrated that in the initial stages of the adhesive capsulitis Cyriax rehabilitation approach offers a quicker and better response by decreasing pain and increasing ROM and functional ability than conventional physical therapy method [7].

In the current study, SPADI showed significant impact with $P < 0.05$ for the experimental group as compared to the control group. The same is supported by a Comparative study conducted in by Krishna et al (2016) was done to evaluate the efficacy of deep friction massage and ultrasound therapy to reduce pain and disability in subjects with acute supraspinatus tendinitis. Group A received cryotherapy and ultrasound, and Group B delivered an ultrasound and deep friction massage. The outcome measure used by the study was VAS, SPADI. The study concluded that therapeutic ultrasound with cryokinesis and therapeutic ultrasound with a deep friction massage were effective in treating supraspinatus tendonitis [10].

In the present study the SPADI and ROM for the experimental group showed significant impact with $p < 0.05$ when compared to the control group. This finding correlates with a comparative study conducted by Sah .et al (2017), that was done to compare the efficacy of Gong's mobilization and

Cyriax (deep friction massage) manipulation in subjects with Frozen shoulder. One group deal with the Gong's mobilization and another group deal with Cyriax manipulation. The outcome measure used by the study was SPADI, and ROM by goniometer. The study concluded that Gong's mobilization and Cyriax manipulation are equally successful in enhancing abduction of the shoulder and reducing the functional deficit [16].

Between the group analyses, even cryotherapy alone showed improvement in the present study. The results of this study support the result conducted by the study of Dupuis et al. This study included 44 participants with acute tendinopathy of the rotator cuff, who were randomly assigned either the exercises or the cryotherapy group. Symptoms and functional limitations were assessed at weeks 0, 2 and 6 using self-questionnaires, while the acromio-humeral length, shoulder power and active ROM were assessed at 0 and 2 respectively. The study concluded that there was statistically significant improvement in symptoms and function in each group [14].

Within the group analyses even cryotherapy alone showed improvement in the present study. This study supports the result conducted by Srivastava. et al (2018), that was done to evaluate the efficacy of Mobilization with Movement (MWM) and cryotherapy in subject with shoulder impingement syndrome. For six sessions, both participants were assigned either of the two groups undergoing MWM or cryotherapy treatment along with impairment-activities and randomized using block randomization procedure. The outcome measure used by the study was VAS, Goniometer and SPADI. The study concluded that after six therapy sessions, pain and disability scores decreased significantly and ROM improved in both groups [12].

Hence, it can be concluded that both the interventions i.e., Cyriax's deep friction massage with conventional therapy as well as cryotherapy with conventional physical therapy is effective in Adhesive capsulitis with respect to pain, functional activity, and range of motion.

5. CONCLUSION

In this study, all the selected outcome measures differed between before and after the interventions in both the group. It indicated that

the selected interventions are effective in improving the outcome measures. Thus, through the present study we may conclude that both the interventions are equally effective in managing symptoms in adhesive capsulitis.

6. LIMITATIONS

The major limitation of the study is the small sample size. We could not follow up for the long-term effects of the interventions.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Obtained ethical clearance from the Institutional Ethical Committee of Nitte Institute of Physiotherapy.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

The peer review history for this paper can be accessed here:
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