**Original Article**

Efficacy of Dynamic VS Closed Kinematic Exercise Combined with Stretching in Adhesive Capsulitis- a double blinded randomized controlled trial.

Rajalaxmi.V¹, S.Vasanthi², S.Sathy³, K.Kirupa⁴, S.M.Divya Mary⁵, Vani Aravind⁶, N.Muthukumaran⁷

**Abstract:**

**Objective:** To compare the efficacy of Dynamic exercise and Closed kinematic exercise combined with stretching in adhesive capsulitis. **Background of the study:** Adhesive capsulitis is a condition characterized by stiffness and pain in the shoulder joint. It is a painful and disabling disorder of unclear cause in which the shoulder capsule, the connective tissue surrounding the shoulder becomes inflamed and stiff, restricting ROM and causing chronic pain. **Methodology:** This was an experimental study design with Pre-Post test. 30 samples were selected from 45 volunteers based on the inclusion criteria. Group A-Dynamic exercise with stretching, Group B-Closed kinematic exercise with stretching, SWD is commonly given to the patients for 1 week. **Results:** The result concludes both the groups showed improvement while group A received Dynamic exercise with stretching was comparatively better than the Group B received Closed kinematic exercise with stretching.

**Keywords:** Adhesive capsulitis; Dynamic exercise; closed kinematic exercise; stretching; visual analogue scale; Shoulder pain disability index

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**Introduction**

Adhesive capsulitis is a self-limiting condition characterized by painful, active and passive range of motions are limited of >25% in at least two actions.¹² Naviaser (1983) referred the term as adhesive capsulitis after the open surgery for affected shoulder.³ The aetiology depends on primary or secondary, Primary if the onset is idiopathic, Secondary from surgical event.⁴ There are three subcategories of the secondary frozen shoulder include systemic, Extrinsic and Intrinsic factors.² Adhesive capsulitis is more prevalent in women & common in 40 - 65 years old with general population 2 -5%⁵,⁶ and the diabetic populations 10 - 20 %.⁷,⁸ Individuals having adhesive capsulitis 5 - 34 % on the contra lateral shoulder at some point. Approximately 14 % of cases has bilateral involvement.² Therisk factors include trauma, prolonged immobilization, thyroid disease, stroke, myocardial infarcts, and presence of autoimmune disease.⁵,⁷ The clinical presentation of the adhesive capsulitis patient’s report an insidious onset with a progressive increase in pain and gradual decrease in range of motion.²⁹ Sometimes symptoms may never fully subside in many patients. [10][11] The three clinical phases are the Acute, Adhesive capsulitis / Frozen /

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Stiffening phase, Resolution / Thawing
Adhesive capsulitis can be treated with physical therapy and anti-inflammatory measures, these outcomes are not always superior to other interventions. Injury or surgery to the shoulder may cause blood flow damage reducing recovery, reported after breast and lung surgery.

Short wave diathermy (SWD) is a deep tissue electrotherapeutic modality, produce electromagnetic field. This modality produces electromagnetic energy that is used to generate heat in body tissue. It is used in continuous mode or pulsed mode. Stretching is a form of physical exercise in which a specific muscle group is deliberately stretched to improve muscle elasticity.

The shoulder pain and disability index (SPADI) is a self-administered questionnaire to measure the pain and disability associated with shoulder pathology. The pain VAS is a one-dimensional measure of pain intensity. The visual analogue scale is a valid and reliable chronic pain intensity. The scale is most commonly anchored by “no pain” (score of 0) and “pain as bad as in could be “or worst imaginable pain”.

Procedure
This was an experimental study design with Pre-Post test, was conducted in the outpatient Physiotherapy department of ACS Medical college & hospital. It took nearly 3 months to complete the study (Jan 2018-April 2018). 30 samples were selected from 45 volunteers based on the inclusion criteria both genders are included in this study, subjects below 45 years and above 65 years patients, unilateral adhesive capsulitis, VAS pain score is above 4 and below 7, SPADI score is above 3 and below 8 & excludes those with systemic illness and connective tissue disorders, pregnancy, spinal pain or upper limb fracture in the past one year, cervical pain at rest, diabetic patients. Once the study get approved from IRB (IRB REF NO: IV C- 050/ PHYSIO/ IRB/2017-2018) The samples were divided into two groups by lottery methods where even will be categorized in group A & odd in group B. The sample will be full explained about the study & the questionnaires to be filled. They were then asked to fill the consent form in acceptance to participate in study, which duly signed by the samples &Therapist. Initially demographic details like, age, sex, height, weight, were collected assuring confidentiality of the same.

Flow diagram is the progress through the phase of a parallel randomized trial of two groups that is, enrolment, intervention, allocation, follow–up and data analysis.

**Group A (Dynamic exercise with stretching)** 15 subjects received Dynamic exercise with Stretching for 30 minutes per day for 5 days in a week, for 8 weeks. Dynamic exercises, kneeling thoracic rotation, Dynamic hug exercise, Squats push ups, Wringing out the towel.

**Group B (Closed kinematic exercise with stretching)** 15 subjects received Wall Push up’s, Cat and camel exercise, Single arm hold opposite arm resisted multi angle motions, Single arm Stability, opposite arm reaches in multiple angles.

**Common intervention** - Anterior shoulder stretch, Posterior shoulder stretch, Supraspinatus stretch.

Both groups were given short wave diathermy for 1 week 15 minutes /day. The exercise protocol is given to the patients for 8 weeks, 5 repetitions for first 4 weeks one session /day than progressed to 10 repetitions for next 4 weeks two sessions /day.

**Ethical Considerations:** The manuscript is approved by the Institutional Review board of faculty of physiotherapy (IRB REF NO: IV C- 050/ PHYSIO/IRB/2017-2018). All the procedures were performed in accordance with the ethical standards of the responsible ethics committee both (Institutional and national) on human experimentation and the Helsinki Declaration of 1964 (as revised in 2008).

**Results**
On comparing the Mean values of Group A & Group B on VAS Score, it shows significant decrease in the post test Mean values but (Group A - Dynamic exercise with stretching ) shows (1.43) which has the Lower Mean value is more effective than (Group B - Closed Kinematic Exercise with stretching ) (3.88) at P ≤ 0.001.

On comparing the Mean values of Group A & Group B on Shoulder Pain and Disability Index (SPADI), it shows significant decrease in the post test Mean
The purpose of the study was to compare the efficacy of stretching with closed kinematic exercise and dynamic exercise with stretching in the management of subjects with adhesive capsulitis. This is also supported by Prentice, William E. (2003) Group A showed significant changes may be due to the application of dynamic exercise with stretching is improved functional ability. In this study it was found that adhesive capsulitis was reported to be more common in women, especially between the age group of 40 to 60 years. This is in accordance to the study done by Neviaser RJ; Neviaser TJ in which they concluded the condition is more prevalent in women.3

Fukadaetal. found a significant decrease in pain scores in the PSWD treatment group compared to a placebo and a control group12. Atamaz et al .did not find a significant change in pain scores in the SWD group as compared to a sham SWD group13. Further, during incremental dynamic exercise Ap En increased from the start to the end with and without parasympathetic blockade, indicating that non-vagal influnents contribute to changes in ApEn.34,35

The findings indicate that CKC exercise can improve balance in chronic stroke patients, and this improvement may carry over into an improvement in functional performance37. This study concluded that CKC exercise appears to be more effective at improving dynamic balance ability than OKC exercise within a six-week training period38. The results indicated that a 60-second stretch was more effective in increasing knee extension ROM than a 15- or 30-second stretch within this elderly group. These results differ from those of Bandy and Irion39 who reported that a 30-second stretch was as effective as a 60-second static stretch of the hamstring muscles. More recently, Bandy et al16 reported that there was no difference between stretching once or repeating the stretch 3 times using either a 30- or 60-second static stretch. Stretching exercises: effect on passive extensibility and stiffness in short hamstrings of healthy subjects.40

The subjects showed significant pain relief within Group A and Group B respectively. It was also noted that Group A showed better pain relief as compared to Group B. The disability was assessed using shoulder pain and disability index (SPADI). Here the subjects showed less disability score in both the group A and Group B. Group A showed less disability as compared to Group B score. When Group A and Group B were compared, Group A showed better results than Group B. Our data supported alternate hypothesis there is some significant difference between dynamic exercises with stretching is more effective than closed kinematic exercise with

Table 1: comparison of vas score between Group – A and Group - B

<table>
<thead>
<tr>
<th>#VAS</th>
<th>GROUP-A</th>
<th>GROUP-B</th>
<th>t-TEST</th>
<th>df</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN</td>
<td>S.D</td>
<td>MEAN</td>
<td>S.D</td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>PRE-TEST</td>
<td>6.02</td>
<td>.786</td>
<td>5.97</td>
<td>.688</td>
<td>.198</td>
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<tr>
<td>POST-TEST</td>
<td>1.43</td>
<td>.457</td>
<td>3.88</td>
<td>.470</td>
<td>-14.43</td>
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</tbody>
</table>

Table 2: Comparison of shoulder pain and disability index (SPADI) between Group – A and Group - B

<table>
<thead>
<tr>
<th>#SPADI</th>
<th>GROUP-A</th>
<th>GROUP-B</th>
<th>t-TEST</th>
<th>df</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN</td>
<td>S.D</td>
<td>MEAN</td>
<td>S.D</td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>PRE-TEST</td>
<td>75.11</td>
<td>14.80</td>
<td>75.20</td>
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<td>-.017</td>
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<tr>
<td>POST-TEST</td>
<td>23.11</td>
<td>7.02</td>
<td>34.58</td>
<td>14.56</td>
<td>-2.74</td>
</tr>
</tbody>
</table>

Table 3: Comparison of vas within Group – A & Group – B between pre & post test values

<table>
<thead>
<tr>
<th>#VAS</th>
<th>GROUP-A</th>
<th>GROUP-B</th>
<th>t-TEST</th>
<th>df</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN</td>
<td>S.D</td>
<td>MEAN</td>
<td>S.D</td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>PRE-TEST</td>
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<td>1.43</td>
<td>.457</td>
<td>19.93</td>
</tr>
<tr>
<td>POST-TEST</td>
<td>5.97</td>
<td>.688</td>
<td>3.88</td>
<td>.470</td>
<td>11.96</td>
</tr>
</tbody>
</table>

Table 4: Comparison of shoulder pain and disability index (SPADI) within Group – A & Group – B between pre & post test values

<table>
<thead>
<tr>
<th>#SPADI</th>
<th>GROUP-A</th>
<th>GROUP-B</th>
<th>t-TEST</th>
<th>df</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN</td>
<td>S.D</td>
<td>MEAN</td>
<td>S.D</td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>PRE-TEST</td>
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<tr>
<td>POST-TEST</td>
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<td>34.58</td>
<td>14.56</td>
<td>13.94</td>
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</table>
stretching. One of the study concluded that Active release technique has yielded significant reduction in pain and improvement in range of motion in subjects with adhesive capsulitis. Another findings study suggest that closed kinematic exercises if added to conventional physiotherapy in the treatment of knee osteoarthritis is more beneficial. The study concluded that a short term intervention of kinesio-taping yielded significant reduction in pain and improvement in functional abilities and also the shoulder range of motion in subjects with shoulder impingement syndrome. Otago Exercise Program is effective and can be used as a supplemental programme to regular supervised exercise classes. The OEP can be beneficial for elderly patients with weakness and chronic lower back pain. Obese person tend to have a higher prevalence of adhesive capsulitis and one study shows that there was significant differences exist in the walking time and the FVC, FEV1/FVC values between Obese and Non obese individuals.

**Conclusion**

In this study concluded that Group A (dynamic exercise with stretching) is more effective in reducing pain and disability than the Group B (closed kinematic exercise with stretching) in adhesive capsulitis.

**Conflict of Interest:** ‘Conflicts of interest: none’

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Authors’ contribution:** All authors have contributed equally

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Editing and approval of final draft: V. RAJALAXMI, N. Muthukumaran
Reference:


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