

# Comparative Study of Functional Outcome of Intra-articular Corticosteroid Injection, Manipulation under Anesthesia with Supervised Physical Therapy in Adhesive Capsulitis of Shoulder Joint: A Prospective Clinical Study

Pravin Sidharth<sup>1</sup>, Apoorva Sinha<sup>2</sup>, Vishal Lal<sup>3</sup>, Amit Aggarwal<sup>4</sup>, Vinit Singh<sup>5</sup>

<sup>1</sup>Senior Resident, Department of Orthopaedics, Sawai ManSingh Medical College, Jaipur, Rajasthan, India, <sup>2</sup>Private Practitioner, King George's Medical University, Lucknow, Uttar Pradesh, India, <sup>3</sup>Postgraduate Student, Department of Orthopaedics, Mahatma Gandhi Medical College, Jaipur, Rajasthan, India, <sup>4</sup>Senior Resident, Department of Orthopaedics, SMS Medical College, Jaipur, Rajasthan, India, <sup>5</sup>Assistant Professor, Vyas Institutes of Higher Education, Garhwa, Jharkhand, India

## Abstract

**Introduction:** Adhesive capsulitis of shoulder is disabling and presents with progressive pain and restriction of movement of shoulder joint mostly in geriatric patients. Hence, this study was conducted to interpret better modality of conservative treatment in adhesive capsulitis of shoulder joint.

**Materials and Methods:** A prospective clinical study was conducted on 50 carefully selected patients, dividing into 2 groups, i.e., Group A (receiving intra-articular corticosteroid injection) and Group B (receiving manipulation under anesthesia) with supervised physical therapy.

**Results:** There was male predominance in both Group A and Group B. Prevalence was noted more in the non-dominant limb. There is improvement in abduction, external and internal rotation, and shoulder pain and disability index (SPADI) score in both groups but Group A has significant improvement as compared to Group B ( $P < 0.05$ ).

**Conclusion:** Both the modalities are highly effective in improving pain and disability in the patients with adhesive capsulitis of the shoulder joint. Spontaneous recovery does not necessarily occur even after a long period so we recommend that these cost-effective modalities should be offered to all patients with of adhesive capsulitis and teach them that these modalities would be of more value if carried out an early stage of disorder.

**Key words:** Capsulitis, Physical therapy modalities, Steroids

## INTRODUCTION

Adhesive causalities of the shoulder joint have been very commonly seen in a good number of patients from the geriatric age group with complains of pain with progressive restriction of both active and passive shoulder

joint movement. It was first described by Dupley<sup>1</sup> in 1872 as humeroscapular periartthritis caused by subacromial bursitis. Neviasser<sup>2,3</sup> based on clinical observation and pathological findings coined it as “adhesive capsulitis.”

The incidence of adhesive capsulitis is approximately 3-5%, but several conditions are associated with increased incidences including female gender, diabetes mellitus, cervical disc disease, prolong immobilization, hyperthyroidism, stroke or myocardial infarction, autoimmune disease, and trauma.

Although typically described as a self-limiting disease process, the natural history<sup>4,7</sup> of adhesive capsulitis have

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**Corresponding Author:** Dr. Pravin Sidharth, Kanchan Kutir, Krishna Nagar Colony, Ratu Road, Ranchi - 834 001, Jharkhand, India.  
 Phone: +91-9680418160/9214007004. E-mail: pravin.siddharth@gmail.com

shown that it can lead to long-term disabilities over the course of several years. Treatment modalities described in literature includes supervised physical therapy, NSAIDS, oral corticosteroids, intra-articular steroids injections, distension arthrography, close manipulation under anesthesia, open surgical release, and arthroscopic capsular release. Our study includes intra-articular corticosteroids injection with anti-inflammatory properties and manipulation under anesthesia, which disrupts capsular fibrosis. Both group of patients received supervised physical therapy with specific stretching and strengthening the program.

### Aim and Objectives

To assess better modality of conservative management of adhesive capsulitis of shoulder joint between 2 groups in terms of:

- Increase in range of motion of joint (abduction, external rotation, internal rotation)
- Increase in shoulder pain and disability index (SPADI) score.

## MATERIALS AND METHODS

A prospective clinical study was conducted on 50 carefully selected patients, dividing into 2 groups, i.e., Group A (receiving intra-articular corticosteroid injection) and Group B (receiving manipulation under anesthesia) with supervised physical therapy.

### Patient Inclusion Criteria Includes

Age more than 18 years, giving informed consent, a trial of opiate analgesia or non-steroidal anti-inflammatory drugs was given by their consultant prior to referral, at least 1-month history of pain and stiffness of the shoulder for which no other cause could be identified. Documented restriction of passive glen humeral and Scapulothoracic motion of: Abduction  $\leq 100^\circ$ , external rotation  $< 50\%$  of the total range of movement ( $< 40^\circ$ ), internal rotation only to the sacrum or less.

### Exclusion Criteria Includes

Patient with Intrinsic pathologies of the shoulder: Biceps tendinitis, calcified tendonitis, history of fracture and dislocation of shoulder, arthritis of glenohumeral joint or acromioclavicular joint, sympathetic dystrophy, rotator cuff tear, patient with extrinsic problems: Neuromuscular disorder (parkinsonism), referred pain from an associated condition: Extrusion of a cervical disc with radiculopathy, history of previous surgery of affected shoulder.

Clinical history, pain assessment, shoulder range of movement were noted, standard radiographs in true AP, lateral,  $10^\circ$  caudal outlet Y radiograph were taken to rule

out any bony and soft tissue pathology with allotment of SPADI scores to all patients.

Group A patients received intra-articular corticosteroids-methyl prednisolone 40-80 mg with 2% lignocaine hydrochloride, 1 ml injected into glenohumeral joint by the anterior approach, and similar amount injected into the subacromial bursa. Group B patients received manipulations performed in a controlled manner. Arm is grasped close to the axilla; forward flexion is initially undertaken rupturing the inferior capsule adhesions. This is followed by an external rotation, first with the arm close to the body and then in abduction. Internal rotation is the final maneuver performed with the arm in abduction (Acronym - Fear). This maneuver will be repeated 2 or 3 times till adequate movement is obtained. Then the patient will be sent to home with an arm sling support. Analgesics and anti-inflammatory medicines were given. Supervised physical therapy was given immediately as per tolerance of the patients. Patients with severe roentgenographic osteopenia and recurrence group were not included in this method. This maneuver is used in patients with severe restriction of glenohumeral joint movement. In supervised physical therapy, adhesive capsulitis is treated with specific four directions stretching and strengthening exercise programs. Both procedures were done as outdoor procedures and patient discharged on the same day.

### Physical Therapy Includes

Stretching exercises (weight pendulum stretch, wall climb, rotator cuff stretch, back of shoulder stretch, overhead stretch, towel stretch internal rotation, towel stretch external rotation, armpit stretch, finger walk, and strengthening exercises: Outward rotation exercises, inward rotation exercise, lifting exercises.

Post procedural regular follow-up at 1, 2, 3, and 6 months. Clinical evaluation was done for any specific complaints, evaluation of a range of movement by SPADI score. Final outcome assessment was done after comparing observations at the first visit, 1, 3 months, and final follow-up at 6 months.

## RESULTS AND OBSERVATIONS

Group A consists of 25 patients comprising 16 males and 9 females with mean age of 55.7 (standard deviation [SD] = 6) year, Group B consists of 25 patients comprising 18 males and 7 females with mean age of 49.9 (SD = 6.7) year. Adhesive capsulitis of shoulder is considered a disease of middle-aged persons common in 40-70 years. There was male predominance in both Group A and Group B. It may reflect health awareness of the society and female

literacy rate. Maximum belonging to middle class (72% in Group A, and 52% in Group B). Prevalence was noted more in the non-dominant limb. Average duration of pain in Group A = 3.8 months, (SD ± 1.4, and in Group B = 4.8 months, (SD ± 2). Average duration of restriction of range of movement in Group A = 2.4 months, (SD ± 1.2) and in Group B = 3 months, (SD ± 1.5). 16% (4 patients) of the patients were diabetic and in Group B: 20% (5 patients) of the patients were diabetic. According to literature patients with diabetes have more severe affection and high recurrence rate. In our study, it was found that 18% (of total 50 patients) of total patients were diabetic. It was also found that patients with diabetes had more severe affection than other patients, but no recurrence was observed in these patients.

**Range of Movement (Base Value)**

*Pretreatment status was noted as*

In Group A: It was found that mean abduction was 68.8, (SD ± 14.8), mean external rotation was 38.8°, (SD ± 7.4), internal rotation 12% (3 patients) had infrared (IR) not up to sacrum, 88% (22 patients had IR up to sacrum and SPADI score 69.6% (SD ± 6.8).

In Group B: It was found that the mean abduction was 65.2°, (SD ± 11.9). Inclusion criteria for a range of abduction were ≤100°. Patients of Group B had more compromised abduction movement than the group. Mean external rotation was 39.2°, (SD ± 8.1). Inclusion criteria for external rotation were ≤50°. Mean internal rotation 28% (7 patients) had IR not up to sacrum, 72% (18 patients) had IR up to sacrum inclusion criteria were for internal rotation was up to or not up to sacrum. Patient's in Group B had a more compromised internal rotation, i.e., not up to the sacrum as compared to Group A. with SPADI score was 75.6% (SD ± 9). Maximum value was 92% and the minimum value was 60%.

This score is based on a questionnaire and is directly proportional to pain score and disability index. As the severity of disease increases SPADI score also increases and vice versa.

**Improvement in Abduction**

Average improvements in Group A, at 1-month = 109.2° (SD ± 10.2), at 3 months = 142.7° (SD ± 12.5), at 6 months = 169.6° (SD ± 8.5). Average improvements in Group B, at 1-month = 103° (SD ± 10.2), at 3 months = 128° (SD ± 10.9), at 6 months = 160.2° (SD ± 10.2) (Graph 1) (P value at 1-month = 0.0396, at 3 months = 0.001, at 6 months = 0.0010).

**Improvement in External Rotation**

Average improvements in Group A, at 1-month = 38.8° (SD ± 6.1), at 3 months = 65.8° (SD ± 7.2), at

6 months = 80° (SD ± 6.6). Average improvements in Group B, at 1-month = 50° (SD ± 7.1), at 3 months = 60.4° (SD ± 7.3), at 6 months = 70.8° (SD ± 6.4) (Graph 2).

P value in between Group A and Group B is not significant at 1-month of follow-up, but were significant at 3 months and 6 months of follow-up as per value of, at 1-month = 0.5111, at 3 months = 0.0118, at 6 months = 0.0000.

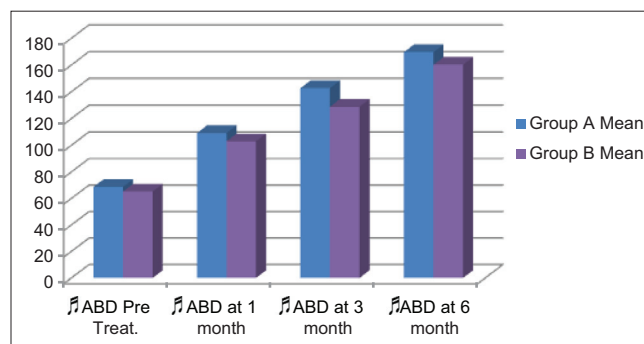
**Improvement in Internal Rotation**

Both groups achieved normal range of internal rotation at 3 months follow-up, which continued up to final follow-up. A full range of painless internal rotation achieved uniformly in both groups.

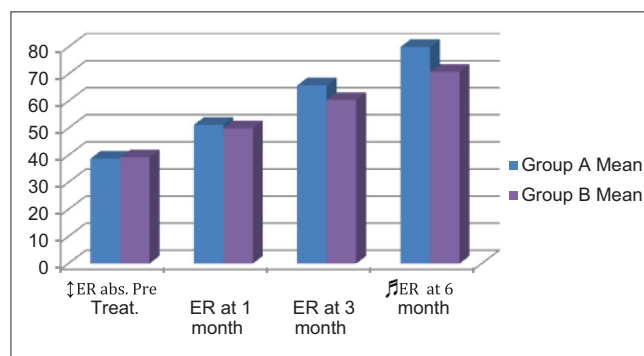
**Improvement in SPADI Score**

Average improvements in Group A were: At 1-month = 29.5% (SD ± 7.5), at 3 months = 16.9% (SD ± 9), at 6 months = 3.3% (SD ± 5.5). Average improvements in Group B: At 1-month = 34.7 (SD ± 8.5), at 3 months = 22.4% (SD ± 6.8), at 6 months = 11% (SD ± 5.2) (Graph 3).

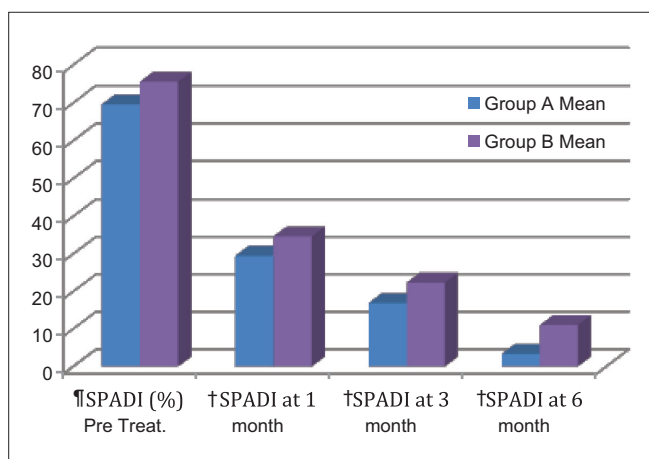
All groups achieved significant improvement in pain and restriction of movement (disability) and achieved almost normal day-to-day activity.



**Graph 1: Improvements in abduction (mean) in Group A and Group B**



**Graph 2: Improvements in external rotation (mean) in Group A and Group B**



**Graph 3: Improvements in shoulder pain and disability index score (mean) in Group A and Group B**

*P* value in between Group A and Group B is significant as per values, at 1-month = 0.0281, at 3 months = 0.0215, at 6 months = 0.000.

## DISCUSSION

There is always a disagreement in the conservative management of idiopathic adhesive capsulitis of shoulder. Pain, disability to perform day-to-day activity with social, psychological, economical need of a human being creates urgency to devise a simple, safe, direct, economical (cost effective) method for treatment of adhesive capsulitis.

In this study, we prospectively evaluated the subjective and objective outcomes of the treatment of idiopathic adhesive capsulitis with two treatment modalities, i.e., intra-articular corticosteroid injection and manipulation under anesthesia both supervised physical therapy.

Frozen shoulder is considered to be a disease of middle age group. It is rare before 40 years with a peak incidence between 40 and 70 years and is unusual after 70 years of age (except secondary traumatic frozen shoulder). In our study, average age was 53.72 year with an almost similar age distribution in each group. It was well supported by most of the previous study.<sup>3-8</sup> Most of the patients in our study belong to lower and middle socio economic class. This indirectly explains poor health concern and low literacy rate. Unlike the previous study, there was male preponderance (68%) more in comparison with the female group. The lower percentage of the female population in our study was because of poor female literacy rate, poor health awareness, dependency on others in seeking medical help, lack of self-confidence, poor motivation toward disease and treatment. It is also well supported in literature.<sup>9</sup>

Maximum patients in our study presented after mean pain duration in 3.8 months (Group A) and duration 4.8 months (Group B). It was almost similar to most of the previous studies.<sup>8,9</sup> This suggests chronicity of disease (benign condition) and indicates neglect on the part of the patient because of which the disease gradually progressed to a severe state with gradual restriction of shoulder range of movement in all planes limiting day-to-day activities.

The average restriction of movement in our study was 2.7 months ranges from 1-month to 6 months. It indicates the early presentation of patients. Patients in Group B had longer mean duration of restriction than Group A. It was seen that patients with severe restriction of shoulder movement were getting difficulties in performing physical therapy, so we included these patients under Group B. It had provided them a help to overcome the initial intra- and extra capsular fibrosis.

In our study, a total 9 patients (18%) of 50 patients were found to be diabetic. Other studies had also shown similar affection.<sup>7,10</sup>

We found a significant correlation with the severity of the disease with diabetes but finally there were no differences in the subjective and objective outcome in these patients compared with the results that were non-diabetic. Literature suggests increase incidences of recurrence of frozen shoulder in these groups, but we did not found any recurrence in any group.<sup>10</sup>

In our series, restriction of movement was as per previous studies,<sup>11</sup> the global loss of all active and passive shoulder movement in all direction. We had chosen restriction of three major movements - abduction, external rotation, internal rotation as inclusion criteria for patient selection.

The average abduction in the series was 67° (Group A = 68.8°, and Group B = 65.2°), which was similar to previous studies.<sup>9,11</sup> Most of the patients in our study had moderate to severe restriction in abduction. It was painful in all patients.

The average abduction in Group A was 68.8°, it was less compromised than in Group B (65.2°). We used a single steroid injection accompanied with supervised physical therapy to reproduce their results. Our dosage and method of injection were similar to the study of Bulgen *et al.*<sup>11</sup> with the additional combination of supervised physical therapy.

90% of our patients were pain-free after the first visit and almost all patients achieved this stage at 8 weeks duration. 40% our patient achieved 150° or more abduction within 8 weeks. In Roy *et al.*<sup>12</sup> study group 73% had achieved

150° or more abduction within 8 weeks, and only 18% of Bulgen *et al.*<sup>11</sup> had achieved this after 10 weeks. We achieved excellent improvement in results at follow-up for 6 months mean ( $169.6^\circ \pm 8.5^\circ$ ), with better results than previous studies.<sup>13-18</sup>

We compared this data with improvement in Group B. There was a significant difference between the results in follow-up (at 1, 3, and 6 months). We found that patients of steroid group achieved a normal range of painless movement in earlier follow-up in comparison of manipulation under anesthesia group. More than half of the patient in Group B achieved  $\geq 150^\circ$  of abduction at their final follow-up. Results were comparative with previous studies.<sup>19-21</sup>

The mean external rotation in the series was 39° (Group A = 38.8° and Group B = 39.2°). The patients in Group B had a more compromised external rotation.

Improvements in the range of external rotation were almost similar in initial follow-up but were statistically better after 3 months and 6 months in Group A than Group B. The improvement in the internal rotation range of movement was similar in both groups.

In young patients to measure full internal rotation, the patient is asked to reach behind his or her back as if trying to scratch an itch in mid-back. This maneuver is often called Apley scratch test. This is a complex motion, as some extension of the shoulder is necessary to move the hand into this position. It is a very useful functional motion, as it required in daily activities such as washing the back, scratching the back, reaching the back pocket, cleaning the perineum, fastening clothes (putting bra in Indian female). Identifying the spinous process of the highest vertebra reached usually quantitates this motion. This is normally T 7 for women and T 9 for men.

We used spinal level for assessment of internal rotation in younger and sacrum level in elderly patients.

The stiffness of joint was associated with significant disability in activity of daily life such as dressing, washing back and perineum, combing, etc.

The most authentic system for frozen shoulder that has taken in most of the previous newer studies was SPADI score system.<sup>13-15</sup> Most of the previous studies did not considered this score for evaluation of pain and disability in the patients of adhesive capsulitis.

It was developed by Roach *et al.*<sup>13</sup> in 1991. By inclusion of 13 different questionnaires related to pain and disability

for the functional assessment of affected shoulder, the score become very authentic and thorough. The severity of affection is directly proportional to the score which is expressed in percentage.

The base values of SPADI score in our study was 72.6%. Total score in Group A was lesser than Group B (mean in Group A = 69.6% and in Group B = 75.6%), i.e., the patient in Group B was more severely affected.

After an average follow-up of 6 months, the improvements in pain and range of movement was good to excellent, which was highly appreciable in each group. The average improvement in Group A (-66.3%) was better than Group B (-64.6%).

Although there was some residual deficit in abduction and external rotation in group B, the finally achieved movement was quite sufficient and painless to perform day-to-day activity specially.

The cause behind these differential statistical data could be the most severe affection and association of diabetes mellitus in these groups.

After manipulation under anesthesia, there was a transient painful episode after intervention, which lasts for 24-72 h. In this period, we did not advised any patient to start any physical therapy, and non-steroidal anti-inflammatory medications were given to these patients. After the subsidence of pain, supervised physical therapy was given to these patients. Although manipulation under anesthesia is highly effective in the treatment of primary frozen shoulder, we observed that supervised physical therapy, when followed by manipulation under anesthesia could be extremely beneficial in patients with primary frozen shoulder with severe affection.

We also noted that timing of presentation of patient does not play much role in final outcome similar to other studies.<sup>22,23</sup>

In our study, all patients achieved good to excellent painless range of movement and it was not influenced by age and sex distribution in these patients. It usually affects non-dominant extremity. In our study, none of the patients had bilateral affection and percentage of involvement of non-dominant limb was in higher percentage.

## CONCLUSION

We found that in both the modalities intra-articular corticosteroid, manipulation under anesthesia were highly

effective in improving shoulder pain and disability in the patients with adhesive capsulitis of the shoulder joint.

We concluded that in those patients in whom the condition is diagnosed in early stages (mild to moderate affection) when capsulitis is developing, the rationale would be for use of intra-articular steroids to prevent subsequent inflammatory fibrosis. In these patients, performance of post interventional physical therapy is not a problem; a single dose of intra-articular corticosteroid injection with supervised physical therapy is highly effective.

However, in later stages when an adhesive capsulitis had developed (moderate to severe), a manipulative under anesthesia will be probably more appropriate to overcome intra- and extra capsular fibrosis. Combining it with supervised physical therapy it will give excellent results.

Faster symptomatic relief decreases in long-term morbidity and earlier return to normal day-to-day activity are the key points in the adoption of these treatment modalities for treatment of frozen shoulder.

As good numbers of patients are diabetic, arthroscopic, and open release of adhesions carries increased risk of infection.

These procedures are simple, safe and cost effective, and patients may not need to go for costly surgical procedure unless it does not respond to conservative management.<sup>22</sup>

In our impression, spontaneous recovery does not necessarily occur even after a long period, so we therefore recommend that these modalities should be offered to all patients with frozen shoulder due to adhesive capsulitis and teach them that these modalities would be of more value if carried out an early stage of disorder.

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