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## An analytical study to compare the efficacy between anterior and posterior approach of intra-articular steroid injection in adhesive capsulitis of shoulder.

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### Abstract

**Background:** Primary adhesive capsulitis is generally idiopathic while the secondary adhesive capsulitis is associated with diabetes, trauma, cardiovascular disease, rotator cuff disease and impingement etc. Early treatment with Intra-articular corticosteroid may reduce synovitis, limits the development of capsular fibrosis and alters the natural history of the disease. We conducted this study to assess the efficacy of Intra-articular steroid on pain reduction and functional outcome in Adhesive Capsulitis of shoulder with a comparison between anterior and posterior approach.

**Methodology:** This was prospective cross-sectional study to compare ultrasound guided anterior and posterior intra-articular steroid injection in adhesive capsulitis of shoulder joint studied in 50 cases, 25 in each group.

**Observations and Results:** The mean age in group A was  $52.54 \pm 6.02$  years and group B was  $55.72 \pm 7.96$  years. There were 12 (48%) and 13 (52%) male patients among Group A and Group B respectively. The mean duration of pain in patients in Group A was  $3.45 \pm 1.81$  months and in Group B was  $3.90 \pm 3.06$  months. There was significant reduction in mean SPADI score and VAS score within each group from before till after the treatment, with no significant difference in clinical or functional outcomes. The majority of patient had excellent outcomes i.e. 48% and 52% in Group A and B respectively, with no difference when compared statistically for procedure outcome. ( $p > 0.05$ ).

**Conclusion:** We observed a significant improvement in clinical and functional status of the patients with no observable difference between the anterior or posterior approach for intra-articular corticosteroid injection.

**Key Words:** Intra-articular steroid injection, Adhesive Capsulitis of shoulder, Anterior injection, Posterior injection.

## Background

Adhesive Capsulitis is known to affect 2%-5% of the general population with majority affect above 45 years of age, thus affecting individual that are still working. It is common in women as compared to men with approximately 70% of patient being women.<sup>1-3</sup>

Adhesive capsulitis can be either primary or secondary. Primary adhesive capsulitis is generally idiopathic while the secondary adhesive capsulitis is associated with diabetes, trauma, cardiovascular disease, rotator cuff disease and impingement etc. Adhesive Capsulitis is characterized by inflammatory thickening and contraction of shoulder joint capsule and surrounding synovium.<sup>4,5</sup> Various conservative treatment like nonsteroidal anti-inflammatory drugs (NSAID), corticosteroid injection and physical therapy and invasive treatment considered when conservative treatment fail like capsular distension, manipulation under general anaesthesia and arthroscopic capsular release.<sup>6-8</sup> But there is no consensus on its standard management. It was reported that intra-articular corticosteroid injection led to fast pain relief and improvement of range of motion and is widely used as a conservative treatment for adhesive capsulitis due to its cost-effectiveness and acceptance among patient.<sup>9-11</sup>

Early treatment with Intra-articular corticosteroid may reduce synovitis, limits the development of capsular fibrosis and alter the natural history of the disease.<sup>12,13</sup> Hence the present study was conducted to compare the efficacy in ultrasound guided anterior and posterior intra-articular steroid injection approach in treatment of adhesive capsulitis of shoulder joint.

## AIM AND OBJECTIVES

1. To assess the efficacy of Intra-articular steroid on pain reduction and functional outcome in Adhesive Capsulitis of shoulder.
2. To compare the efficacy between anterior and posterior injection approach in Adhesive Capsulitis of shoulder.

## MATERIALS AND METHODS

The present study was prospective cross-sectional study to compare ultrasound guided anterior and posterior intra-articular steroid injection in adhesive capsulitis of shoulder joint. The present study period was July 2019 to June 2020. The study was conducted at department of Orthopedics at Apollo Hospital Bilaspur (C.G.) The study population was selected patients diagnosed as Adhesive Capsulitis of shoulder during the study period.

A sample size was 50 eligible patients both male and female with Adhesive Capsulitis of shoulder during study period was included.

Sample Size Estimation:

The sample size was calculated use formula;

$$n = \frac{[DEFF * Np(1-p)]}{[(d^2/Z^2(1-\alpha/2)^2 * (N-1) + p * (1-p))]}$$

- Population size (for finite population correction factor or fpc) (N) : 200
- Hypothesized % frequency of outcome factor in the population 95% +/- (p) : 5
- Design effect (for cluster surveys-DEFF) : b1
- Confidence level(%): 95%
- Sample size: 50
- Result from openEpi, version 3, open-source calculator-SS Proper

Hence, a minimum sample size of 50 cases during study period was randomly selected and included in present study.

### **INCLUSION CRITERIA**

1. Patient aged more than 18yrs healthy adult male and non-pregnant female with painful shoulder in 5th cervical dermatomes distribution of more than 4week and less than 6-month duration with limitation of active and passive range of movement greater than 25% in abduction and external rotation compared with the other shoulder radiographically normal shoulder joint justifying a diagnosis of primary adhesive capsulitis.
2. Secondary adhesive capsulitis in diabetes-controlled patient.
3. Ability to understand and provide informed consent for participation in the study.

### **EXCLUSION CRITERIA**

1. If pain less than 4week because spontaneous recovery may occur in early stage.
2. Patient with symptoms of more than 6-month duration will not considered as patient chronic stage may require different therapeutic approaches.
3. Previous intra-articular injection and on oral steroids.
4. Rotator cuff tendinopathy in which limitation in only one plain of movement.
5. Patient of glenohumeral osteoarthritis on plain x ray.
6. Clinical evidence of complete rotator cuff tear or significant cervical spine disease.
7. History of multiple joint inflammatory disease.
8. Patient contraindication to steroid injection.

Intra-articular steroid (1ml of 40 mg Triamcinolone acetonide) injection mixed with 2ml of 2% Lignocaine was given in Adhesive Capsulitis of shoulder under guidance of ultrasound by anterior and posterior injection approaches.<sup>8</sup>

1. Group A: Intra-articular steroid (1ml of 40mg Triamcinolone acetonide) injection mixed with 2ml of 2% Lignocaine was given under guidance of ultrasound by anterior approach.
2. Group B: Intra-articular steroid (1ml of 40mg Triamcinolone acetonide) injection mixed with 2ml of 2% Lignocaine was given under guidance of ultrasound by posterior approach.

The study was approved by the Ethical Committee of the institute.

### **OBSERVATION AND RESULTS**

We evaluated a total of 50 cases, 25 cases from each group. It was observed that majority of patients in Group A (56%) and Group B (48%) was in age group 51-60 years. The mean age in group A was  $52.54 \pm 6.02$  years and group B was  $55.72 \pm 7.96$  years. There were 12 (48%) and 13 (52%) male patients among Group A and Group B respectively. The majority of patients in Group A were affected by right side (68%) while in Group B left side was affected more (56%). Out of total 50 patients, 12 were having diabetes mellitus. There were 7 (28%) and 5 (20%) diabetic patients among Group A and Group B respectively.

The majority of patients in Group A were in stage 1 (56%) while in Group B stage 2 (48%). There was no difference when two groups were compared statistically for stage of disease. ( $p>0.05$ )

The mean duration of pain in patients in Group A was  $3.45 \pm 1.81$  months and in Group B was  $3.90 \pm 3.06$  months. This difference in duration of pain in patients in two groups was statistically not significant. ( $P > 0.05$ )

The mean duration of stiffness in patients in Group A was  $2.77 \pm 1.67$  months and in Group B was  $2.70 \pm 2.39$  months. This difference in duration of joint stiffness in patients in two groups was statistically not significant. ( $P > 0.05$ )

The mean VAS score in patients before steroid injection in Group A was  $7.48 \pm 1.61$  and in Group B was  $7.32 \pm 1.37$ . This difference in VAS score before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

The mean range of movements of forward flexion in patients before steroid injection in Group A was  $107.08 \pm 27.95$  and in Group B was  $97.00 \pm 21.60$ . This difference in forward flexion before steroid injection in patients in two groups was statistically not significant. ( $P>0.05$ )

Similarly, other ROM like abduction, external and internal rotation before steroid injection in patients in two groups was statistically not significant. ( $P>0.05$ )

Abduction in Group A was  $93.0 \pm 25.49$  and in Group B it was  $87.4 \pm 27.76$ .

External rotation in Group A was  $27.60 \pm 9.80$  and in Group B it was  $27.6 \pm 10.01$ .

Internal rotation in Group A was  $46.40 \pm 11.77$  and in Group B it was  $48.4 \pm 8.12$ .

The mean SPADI score in patients before steroid injection in Group A was  $65.72 \pm 12.23$  and in Group B was  $61.84 \pm 16.01$ . This difference in SPADI score before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

Table 1: Comparison of VAS scores at different intervals among two groups:

VAS Score	Group A	Group B	P value
Before injection	$7.48 \pm 1.61$	$7.32 \pm 1.37$	$>0.05$
1st follow up (6wk)	$3.54 \pm 1.14$	$3.48 \pm 0.96$	$>0.05$
2nd follow up (3month)	$2.16 \pm 1.40$	$1.80 \pm 0.86$	$>0.05$
3rd follow up (6month)	$1.42 \pm 1.86$	$1.00 \pm 0.86$	$>0.05$

( $P>0.05$  statistically not significant)

The above table shows comparison of VAS score in two different groups at different time intervals. It was observed that the mean VAS scores in Group A decrease from  $7.48 \pm 1.61$  before steroid injection to  $1.42 \pm 1.86$  at 6 month. Similarly, VAS score in Group B decrease from  $7.32 \pm 1.37$  before steroid injection to  $1.00 \pm 0.86$  at 6 month.

But comparison of difference in VAS score at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

Table 2: Comparison of SPADI scores at different intervals among two groups:

SPADI Score	Group A	Group B	P value
Before injection	65.72 ±12.23	61.84 ±16.01	>0.05
1st follow up (6wk)	31.66 ±11.98	27.07 ±9.62	>0.05
2nd follow up (3month)	17.35 ±13.84	14.09 ±6.14	>0.05
3rd follow up (6month)	9.87 ±15.49	6.31 ±4.73	>0.05

(P<0.05 statistically significant)

The above table shows comparison of SPADI score in two different groups at different time intervals. It was observed that the mean SPADI scores in Group A decrease from 65.72 ±12.23 before steroid injection to 9.87 ±15.49 at 6 month. Similarly, SPADI score in Group B decrease from 61.84 ±16.01 before steroid injection to 6.31 ±4.73 at 6 month. But comparison of difference in SPADI score at different time intervals in two groups was statistically not significant. (P > 0.05)

Table 3: Comparison of ROM forward Flexion scores at different intervals among two groups:

ROM	Forward flexion		P value
	Group A	Group B	
Before injection	107.8 ±27.95	97.00 ±21.60	>0.05
1st follow up (6wk)	128.8 ±20.73	123.6 ±15.24	>0.05
2nd follow up (3month)	142.2 ±16.07	139.6 ±12.82	>0.05
3rd follow up (6month)	149.4 ±12.44	147.8 ±11.90	>0.05

(P<0.05 statistically significant)

The above table shows comparison of forward flexion in two different groups at different time intervals. It was observed that the mean forward flexion in Group A increases from 107.8 ±27.95 before steroid injection to 149.4 ±12.44 at 6 month. Similarly, forward flexion in Group B increases from 97.00 ±21.60 before steroid injection to 147.8 ±11.90 at 6 month.

But comparison of difference in forward flexion at different time intervals in two groups was statistically not significant. (P > 0.05)

Table 4: Comparison of ROM abduction scores at different intervals among two groups:

ROM	Abduction		P value
	Group A	Group B	
Before injection	93.0 ±25.49	87.4 ±27.76	>0.05
1st follow up (6wk)	123.0 ±25.12	117.4 ±21.84	>0.05
2nd follow up (3month)	141.4 ±18.56	136.8 ±17.49	>0.05
3rd follow up (6month)	152.2 ±16.46	149.0 ±14.57	>0.05

(P<0.05 statistically significant)

The above table shows comparison of abduction in two different groups at different time intervals. It was observed that the mean abduction in Group A increases from 93.0 ±25.49

before steroid injection to  $152.2 \pm 16.46$  at 6 month. Similarly, abduction in Group B increases from  $87.4 \pm 27.76$  before steroid injection to  $149.0 \pm 14.57$  at 6 month.

But comparison of difference in abduction at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

Table 5: Comparison of internal rotation scores at different intervals among two groups:

ROM	Internal rotation		P value
	Group A	Group B	
Before injection	$46.4 \pm 11.77$	$48.4 \pm 8.12$	$>0.05$
1st follow up (6wk)	$53.6 \pm 10.55$	$58.6 \pm 8.95$	$>0.05$
2nd follow up (3month)	$57.4 \pm 7.23$	$62.4 \pm 7.78$	$>0.05$
3rd follow up (6month)	$60.6 \pm 6.17$	$63.4 \pm 7.32$	$>0.05$

( $P < 0.05$  statistically significant)

The above table shows comparison of internal rotation in two different groups at different time intervals. It was observed that the mean internal rotation in Group A increases from  $46.4 \pm 11.77$  before steroid injection to  $60.6 \pm 6.17$  at 6 month. Similarly, internal rotation in Group B increases from  $48.4 \pm 8.12$  before steroid injection to  $63.4 \pm 7.32$  at 6 month.

But comparison of difference in internal rotation at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

Table 6: Comparison of external rotation scores at different intervals among two groups:

ROM	External rotation		P value
	Group A	Group B	
Before injection	$27.6 \pm 9.80$	$27.6 \pm 10.01$	$>0.05$
1st follow up (6wk)	$41.8 \pm 8.14$	$43.4 \pm 9.43$	$>0.05$
2nd follow up (3month)	$50.0 \pm 6.29$	$50.8 \pm 8.12$	$>0.05$
3rd follow up (6month)	$54.4 \pm 7.41$	$54.6 \pm 7.48$	$>0.05$

( $P < 0.05$  statistically significant)

The above table shows comparison of external rotation in two different groups at different time intervals. It was observed that the mean external rotation in Group A increases from  $27.6 \pm 9.80$  before steroid injection to  $54.4 \pm 7.41$  at 6 month. Similarly, internal rotation in Group B increases from  $27.6 \pm 10.01$  before steroid injection to  $54.6 \pm 7.48$  at 6 month.

But comparison of difference in external rotation at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

Table 7: Comparison of procedure outcome among two groups:

Outcome	Group A	Group B	P value
Excellent	12	14	(X <sup>2</sup> =2.41; DF=4; P=0.66)
Very good	03	02	
Good	08	09	
Fair	01	00	
Poor	01	00	
Total	25	25	

( $P > 0.05$  statistically not significant)

The above table shows comparison of procedure outcome among two groups. The majority of patients in Group A had excellent outcome (48%) followed by good outcome (32%).

Similarly, in Group B majority of patients had excellent outcome (56%) There was no difference when two groups were compared statistically for procedure outcome. ( $p > 0.05$ )

### **Discussion**

The present prospective cross-sectional study was conducted to compare the efficacy in ultrasound guided anterior and posterior intra-articular steroid injection approach in treatment of adhesive capsulitis of shoulder joint.

The study was conducted during the period of July 2019 to June 2020 at Department of Orthopaedics, Apollo Hospital Bilaspur.

Patients diagnosed as adhesive capsulitis of shoulder to the Department of Orthopaedics during the study period were included as study population.

Patients with previous intra-articular injection and on oral steroids, rotator cuff tendinopathy, glenohumeral osteoarthritis, complete rotator cuff tear, significant cervical spine disease and history of significant trauma to the shoulder and multiple joint inflammatory disease were excluded from the study. All the subjects included in the study volunteered after proper consent. The study was conducted after obtaining clearance from the ethical committee of the institute. Total sample sizes of 50 patients were included in the study.

The mean duration of stiffness in patients in Group A was  $2.77 \pm 1.67$  months and in Group B was  $2.70 \pm 2.39$  months. This difference in duration of joint stiffness in patients in two groups was statistically not significant. ( $P > 0.05$ )

We observed a difference in duration of pain in patients in two groups which was statistically not significant. ( $P > 0.05$ )

Similar findings observed in Basant Elnady et al<sup>14</sup> where duration of disease did not differ significantly between both groups ( $p \geq 0.05$ )

The mean VAS score in patients before steroid injection in Group A was  $7.48 \pm 1.61$  and in Group B was  $7.32 \pm 1.37$ . This difference in VAS score before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

The mean range of movements of forward flexion in patients before steroid injection in Group A was  $107.08 \pm 27.95$  and in Group B was  $97.00 \pm 21.60$ . This difference in forward flexion before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

Similarly, other ROM like abduction, external and internal rotation before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

The mean SPADI score in patients before steroid injection in Group A was  $65.72 \pm 12.23$  and in Group B was  $61.84 \pm 16.01$ . This difference in SPADI score before steroid injection in patients in two groups was statistically not significant. ( $P > 0.05$ )

Similar findings observed in Basant Elnady et al<sup>14</sup> study where all baseline assessments (VAS pain, SPADI, and ROM regarding abduction, adduction, flexion, extension, external, and internal rotation) did not differ significantly between both groups ( $p \geq 0.05$ )

The mean VAS scores in Group A decrease from  $7.48 \pm 1.61$  before steroid injection to  $1.42 \pm 1.86$  at 6 month. Similarly, VAS score in Group B decrease from  $7.32 \pm 1.37$  before steroid injection to  $1.00 \pm 0.86$  at 6 month. The comparison of difference in VAS score at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

In study by Do-Young Kim et al<sup>15</sup> posterior approach provided more significant improvements than anterior approach in the mean VAS score which was contrast to present study.

The comparison of difference in internal rotation at different time intervals in two groups was statistically not significant. ( $P > 0.05$ )

Similar findings observed in Basant Elnady et al<sup>14</sup> where no significant difference was found between the two groups regarding internal rotation before and after injections. ( $P > 0.05$ )

The majority of patients in Group A had excellent outcome (48%) followed by good outcome (32%). Similarly, in Group B majority of patients had excellent outcome (56%) There was no difference when two groups were compared statistically for procedure outcome. ( $p > 0.05$ )

Do-Young Kim et al<sup>15</sup> compared the results of the ultrasound-guided anterior and posterior approaches to administer glenohumeral steroid injections to patients with primary adhesive capsulitis of the shoulder joint observed no significant difference was observed in the mean functional outcome between the 2 groups at 3 weeks after injection.

Soha F. Khallaf et al<sup>16</sup> evaluate the efficacy of intra-articular steroid injection of the shoulder joint with exercises in the management of patients with adhesive capsulitis and to compare glenohumeral (GH) versus subacromial subdeltoid (SASD) ultrasound-guided approaches observed no significant difference in outcome between two groups after injection. Basant Elnady et al<sup>14</sup> compared the effectiveness of shoulder ultrasound-guided corticosteroid anteriorly, versus posterior approach, in adhesive capsulitis observed group II (anterior approach) showed a statistically significant higher level of improvement regarding VAS pain ( $p = 0.003$ ), SPADI, flexion, abduction, and external rotation, compared to group I ( $p < 0.001$ ). This finding was contrast to present study.

Surykanth Kalluraya et al<sup>17</sup> studied intra-articular corticosteroid injections while comparing the outcome of blinded anterior and posterior injection approaches in the management of adhesive capsulitis observed both groups showed statistically significant improvements in all outcome measures i.e., VAS score, SPADI, shoulder ROM at final outcome. However, comparison between groups did not reveal any statistically significant differences between the two groups.

Bruyn GA et al<sup>18</sup> and Soh E et al<sup>19</sup> reported that ultrasound image-guided corticosteroid injections potentially offer a significantly greater clinical improvement over blind injections in adults with shoulder pain and proved the effectiveness of the ultrasound in symptomatic arthritic shoulder to detect any pathological changes.

Corticosteroid injection has been recognized as an effective treatment for adhesive capsulitis and has provided a short-term benefit in pain reduction and restoration of range of motion compared with physical therapy and oral medication.<sup>8,12</sup> Although the subacromial bursa and rotator interval have also been reported as plausible regions for



injection, injection into the glenohumeral joints is still the most frequently-used location considering capsular constriction is the primary pathology of the adhesive capsulitis.<sup>13</sup> While corticosteroid administration is recognized as a chemical moderator that intervenes with intra-articular inflammation. The intraarticular steroid injection of the shoulder joint followed by stretching and strengthening exercises in patients with adhesive capsulitis decreases pain, improves function and ROM.<sup>8,9</sup> Ultrasonography plays a major role in the evaluation of the shoulder joint as it assess a wide spectrum of pathologies and ultrasound guided injection is an accurate, easy and cost-effective approach.<sup>20</sup>

## CONCLUSION

The present study concludes that ultrasound guided corticosteroid injection has been recognized as an effective treatment for adhesive capsulitis and has provided a short-term benefit in pain reduction and restoration of range of motion by any approach of injection. Ultrasound guided injection is an accurate, easy and cost-effective approach. There was no significant difference found between the anterior or posterior approach for intra-articular corticosteroid injection.

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

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