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Original Research Article

Efficacy of Intra-Articular Corticosteroid Injection in Adhesive Capsulitis of the Shoulder: A Prospective 6-Month Study

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Abstract:

Background: Adhesive capsulitis, commonly known as frozen shoulder, is a disabling condition characterized by progressive pain and restriction of shoulder joint movements. Intra-articular corticosteroid injections are widely used for symptomatic relief due to their anti-inflammatory effects.

Aim: To evaluate the efficacy of intra-articular corticosteroid injections in improving pain, range of motion (ROM), and functional outcomes in patients with adhesive capsulitis over a 6-month follow-up period.

Materials and Methods: This prospective study included 100 patients diagnosed with adhesive capsulitis attending the Physical Medicine & Rehabilitation department of a tertiary care hospital. Patients received a single intra-articular corticosteroid injection under aseptic precautions. Outcome measures included Visual Analog Scale (VAS) for pain, Shoulder Pain and Disability Index (SPADI), and ROM (abduction, flexion, external rotation). Assessments were performed at baseline 6 weeks, 3 months, and 6 months. Statistical analysis was conducted using paired t-test.

Results: Significant improvement in pain scores was observed as early as 6 weeks post-injection ($p < 0.001$), with sustained reduction up to 6 months. ROM showed marked improvement, particularly in abduction and external rotation ($p < 0.001$). SPADI scores demonstrated significant functional improvement over time. Maximum benefit was observed within the first 6–12 weeks.

Conclusion: Intra-articular corticosteroid injection is an effective, safe, and minimally invasive modality for short- to mid-term management of adhesive capsulitis, providing rapid pain relief and improved shoulder function.

Keywords: Adhesive Capsulitis, Frozen Shoulder, Corticosteroid Injection, Intra-Articular Injection, Shoulder Pain, Range of Motion.
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Introduction

Adhesive capsulitis of the shoulder, commonly referred to as frozen shoulder, is a chronic inflammatory condition characterized by progressive pain and significant restriction of both active and passive range of motion (ROM) of the glenohumeral joint. The condition is often self-limiting but may persist for prolonged periods, leading to considerable functional disability and reduced quality of life. It typically affects individuals between 40 and 60 years of age, with a higher prevalence among females and patients with systemic conditions such as diabetes mellitus and thyroid disorders [1].

The pathophysiology of adhesive capsulitis involves synovial inflammation followed by capsular fibrosis and contracture, ultimately leading to joint stiffness and pain. The disease progresses through three clinical stages: the painful "freezing" stage, the stiff "frozen" stage, and the recovery "thawing" stage [2]. Although traditionally considered a self-limiting condition, studies have shown that a significant proportion of patients may experience persistent symptoms and incomplete functional recovery even after several years [3].

Management of adhesive capsulitis remains a subject of debate, with various treatment modalities

aimed at reducing pain, improving mobility, and accelerating recovery. Conservative approaches include nonsteroidal anti-inflammatory drugs (NSAIDs), physiotherapy, and oral, while more invasive interventions include intra-articular injections, hydro dilatation, manipulation under anaesthesia, and surgical release [4]. Among these, intra-articular corticosteroid injection has gained widespread acceptance due to its targeted anti-inflammatory action and ability to provide rapid symptomatic relief.

Corticosteroids exert their therapeutic effect by suppressing synovial inflammation, reducing capsular thickening, and inhibiting fibroblast proliferation. This results in decreased pain and improved joint mobility, particularly in the early stages of the disease. Several studies and systematic reviews have demonstrated that intra-articular corticosteroid injections provide significant short-term pain relief and improvement in ROM compared to placebo or other conservative treatments [5]. Furthermore, early administration of corticosteroids has been associated with better clinical outcomes, suggesting the importance of timely intervention [6].

Hanish SJ et al. reported that corticosteroid injections significantly improved pain and shoulder function in the short term, especially within the first 6 weeks of treatment [5]. Similarly, multiple prospective and randomized studies have shown that patients receiving intra-articular corticosteroid injections experience faster improvement in symptoms compared to those undergoing physiotherapy alone [7]. However, the long-term benefits of corticosteroid injections remain controversial, with some studies indicating that the effects may diminish over time, aligning with the natural course of the disease.

Despite extensive research, there remains variability in clinical outcomes due to differences in study design, injection techniques, dosage, and patient selection. Additionally, there is ongoing debate regarding the optimal timing, number of injections, and long-term efficacy of corticosteroid therapy in adhesive capsulitis. Therefore, further prospective studies with standardized protocols are necessary to better define the role of intra-articular corticosteroid injections in the management of this condition.

In this context, the present prospective study was undertaken to evaluate the efficacy of intra-articular corticosteroid injections in patients with adhesive capsulitis over a 6-month follow-up period. The study aims to assess improvements in pain, range of motion, and functional outcomes, thereby contributing to the existing body of evidence and helping to guide clinical decision-making.

Materials and Methods

Study Design: This was a hospital-based prospective interventional study conducted to evaluate the efficacy of intra-articular corticosteroid injections in patients diagnosed with adhesive capsulitis of the shoulder over a follow-up period of 6 months.

Study Setting: The study was carried out in the Department of Physical Medicine & Rehabilitation at a tertiary care teaching hospital. Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study, and the study adhered to the principles outlined in the Declaration of Helsinki.

Study Duration: The study was conducted over a period of 12 months, which included patient recruitment, intervention, and follow-up assessments.

Sample Size: A total of 100 patients clinically diagnosed with adhesive capsulitis were included in the study based on predefined inclusion and exclusion criteria.

Sampling Method: Patients presenting to the outpatient department who fulfilled the eligibility criteria were consecutively enrolled after obtaining informed written consent.

Inclusion Criteria

- Patients aged between 30 and 70 years
- Clinical diagnosis of adhesive capsulitis characterized by:
    - Shoulder pain for at least 1 month
    - Restriction of both active and passive range of motion, particularly external rotation
- Willingness to participate and provide informed consent

Exclusion Criteria

- History of trauma or fracture around the shoulder joint
- Rotator cuff tear or other significant shoulder pathology confirmed clinically or radiologically
- Prior intra-articular steroid injection within the last 6 months
- Severe osteoarthritis of the shoulder joint
- Systemic inflammatory diseases (e.g., rheumatoid arthritis)
- Contraindications to corticosteroid use (e.g., uncontrolled diabetes, infection at injection site)
- Pregnant or lactating women

Pre-Intervention Assessment

All patients underwent a detailed clinical evaluation including:

- Demographic data (age, gender, occupation)
- Duration and severity of symptoms
- Dominant side involvement
- Associated comorbidities (especially diabetes mellitus and thyroid disorders)

Outcome Measures

The following parameters were assessed at baseline:

Pain Assessment:

- Measured using the Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (worst imaginable pain)

Functional Assessment:

- Evaluated using the Shoulder Pain and Disability Index (SPADI), which includes pain and disability subscales

Range of Motion (ROM): Measured using a goniometer for:

- Forward flexion
- Abduction
- External rotation

Intervention Procedure: All patients received a single intra-articular corticosteroid injection under strict aseptic precautions.

Drug Used: Triamcinolone acetonide (40 mg) mixed with 2 mL of 1% lignocaine

Technique:

- The posterior approach to the glenohumeral joint was used
- The injection site was identified 2–3 cm inferior and medial to the posterolateral corner of the acromion
- After skin sterilization, a 22-gauge needle was inserted into the joint space
- Correct intra-articular placement was ensured clinically by the absence of resistance during injection

Post-Injection Care:

- Patients were advised to rest the shoulder for 24–48 hours
- A standardized physiotherapy protocol was initiated after 48 hours, including:
    - Pendulum exercises
    - Passive stretching
    - Gradual active range of motion exercises

Follow-Up and Outcome Assessment: 6 weeks, 3 months, 6 months

At each follow-up visit, the following parameters were reassessed:

- VAS score for pain
- SPADI score for functional assessment
- Range of motion (ROM) (flexion, abduction, external rotation)

Compliance with physiotherapy and any adverse effects were also documented.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software (SPSS version XX or equivalent).

- Continuous variables were expressed as mean ± standard deviation (SD)
- Categorical variables were expressed as frequencies and percentages
- Paired t-test was used to compare pre- and post-intervention outcomes
- A p-value < 0.05 was considered statistically significant

Results

Table 1: Demographic and Baseline Clinical Characteristics

Variable	Number	Percentage (%)
Mean Age (years)	52.4 ± 8.6	
Male	44	44%
Female	56	56%
Right Shoulder Involvement	62	62%
Left Shoulder Involvement	38	38%
Diabetes Mellitus	36	36%
Mean Duration of Symptoms (months)	4.8 ± 1.9	
Dominant Side Affected	58	58%

A total of 100 patients diagnosed with adhesive capsulitis were included in the study and followed up at 6 weeks, 3 months, and 6 months. All patients completed the follow-up period with no major complications reported. Mean age was 52.4 ± 8.6 years with a slight female predominance (56%). The dominant shoulder was involved in 58% of cases and 36% of patients had diabetes mellitus indicating its strong association with adhesive capsulitis. The mean symptom duration indicates that most patients presented in the early to mid-stages of disease.

Table 2: Comparison of Mean VAS Scores at Different Follow-Up Intervals

Time Interval	Mean VAS Score (Mean ± SD)	Percentage Reduction	p-value
Baseline	7.8 ± 1.1	—	—
6 weeks	4.2 ± 1.0	46.1%	<0.001
3 months	2.8 ± 0.9	64.1%	<0.001
6 months	2.1 ± 0.8	73.0%	<0.001

There was a statistically significant reduction in pain scores at all follow-up intervals ($p < 0.001$). At 6 weeks, pain reduced by 46.1%, indicating rapid onset of action. Further reduction was observed at 3 months (64.1%) and 6 months (73.0%), suggesting sustained improvement. Maximum improvement occurred within the first 3 months, after which the rate of improvement plateaued.

Table 3: Improvement in Shoulder Range of Motion

Parameter	Baseline	6 Weeks	3 Months	6 Months	% Improvement (6 months)	p-value
Flexion	85 ± 15	115 ± 12	135 ± 10	150 ± 8	76.5%	<0.001
Abduction	80 ± 14	110 ± 13	130 ± 11	145 ± 9	81.3%	<0.001
External Rotation	20 ± 6	35 ± 8	50 ± 7	60 ± 6	200%	<0.001

There was a significant improvement in all ROM parameters ($p < 0.001$). External rotation showed the highest percentage improvement (200%), followed by abduction (81.3%) and flexion (76.5%) at 6 months. The most substantial gains were observed between baseline and 3 months, indicating that corticosteroid injections are particularly effective during early and mid-phase recovery.

Table 4: SPADI Score Improvement over Time

Time Interval	Mean SPADI Score (Mean ± SD)	Percentage Improvement	p-value
Baseline	72.5 ± 8.5	—	—
6 weeks	48.3 ± 7.2	33.4%	<0.001
3 months	30.6 ± 6.5	57.8%	<0.001
6 months	20.4 ± 5.8	71.8%	<0.001

Functional disability, as assessed by SPADI, improved significantly over time ($p < 0.001$). A 33.4% improvement was observed at 6 weeks, which increased to 71.8% at 6 months. This indicates that intra-articular corticosteroid injection leads to substantial functional recovery alongside pain reduction.

Discussion

The present prospective study evaluated the efficacy of intra-articular corticosteroid injections in adhesive capsulitis over a 6-month period. The findings demonstrated significant improvement in pain, range of motion, and functional outcomes, particularly within the first 3 months following injection.

Pain reduction was one of the most notable outcomes in this study. The VAS score showed a reduction of 46.1% at 6 weeks and 73% at 6 months, indicating both rapid and sustained analgesic effects. These findings are consistent with previous studies that have reported significant short-term pain relief following corticosteroid injections. [8] Similarly, clinical evidence suggests that corticosteroid injections provide measurable improvements in pain and function within 12 weeks of treatment [9].

In the present study, the improvement in ROM was substantial, particularly in external rotation, which increased by 200% at 6 months. This is clinically important because restriction of external rotation is a hallmark feature of adhesive capsulitis. Comparable improvements have been reported in previous studies, where intra-articular corticosteroid injections resulted in significant gains in passive and active ROM across multiple planes [10]. Additionally, a randomized control trial demonstrated better functional outcomes and ROM improvement in patients receiving intra-articular injections with nerve block [11].

Functional recovery, as measured by SPADI scores, also showed progressive improvement over time in the current study. The reduction of 71.8% at 6 months indicates a substantial restoration of shoulder function. Similar findings have been reported in systematic review of randomised clinical trials, where SPADI scores significantly improved following corticosteroid injections, particularly during the early stages of treatment [2].

The temporal pattern of improvement observed in this study is noteworthy. Most of the clinical benefits were achieved within the first 3 months, after which the rate of improvement slowed. This aligns with existing literature suggesting that corticosteroid injections are most effective in the early inflammatory phase of adhesive capsulitis. While pain relief is prominent in the short term, long-term outcomes may be influenced by the natural course of the disease. Evidence indicates

that although pain relief may diminish over time, improvements in ROM can persist longer [12].

Recent studies have also compared corticosteroid injections with other modalities such as suprascapular nerve blocks and hydrodilatation. A meta-analysis reported that suprascapular nerve blocks may provide superior pain relief at 12 weeks compared to corticosteroid injections, although both modalities improve function and ROM [3]. Similarly, hydrodilatation has been shown to offer comparable or slightly better outcomes in some studies, suggesting that combination or alternative therapies may be beneficial in selected cases [4].

Despite these comparisons, intra-articular corticosteroid injection remains a widely accepted first-line intervention due to its simplicity, cost-effectiveness, and rapid onset of action. However, not all patients respond equally. Studies have identified factors such as diabetes mellitus, prolonged duration of symptoms, and advanced fibrosis as predictors of poorer outcomes following injection therapy [13].

The present study has several strengths, including a prospective design, standardized intervention protocol, and multiple follow-up intervals. However, certain limitations must be acknowledged. The absence of a control group limits the ability to compare outcomes with other treatment modalities. Additionally, imaging guidance was not used for injections, which may influence accuracy. Long-term follow-up beyond 6 months was also not conducted.

Overall, the findings of this study are consistent with existing literature and reinforce the role of intra-articular corticosteroid injections as an effective treatment modality for adhesive capsulitis, particularly in the early stages of the disease.

Conclusion

Intra-articular corticosteroid injection is an effective and safe treatment modality for adhesive capsulitis, providing rapid pain relief, significant improvement in range of motion, and enhanced functional outcomes. Maximum benefits are observed within the first 3 months, with sustained improvement up to 6 months. Early intervention appears to be crucial for optimal results.

References

1. Wang W, Shi M, Zhou C, Shi Z, Cai X, Lin T, Yan S. Effectiveness of corticosteroid injections in adhesive capsulitis of shoulder: A meta-analysis. Medicine (Baltimore). 2017 Jul;96(28):e7529. doi: 10.1097/MD.0000000000007529. PMID: 28700506
2. Koh KH. Corticosteroid injection for adhesive capsulitis in primary care: a systematic review of randomised clinical trials. Singapore Med J. 2016 Dec;57(12):646-657. doi: 10.11622/smedj.2016146. Epub 2016 Aug 29. PMID: 27570870
3. Harley J, Austin C, Harrison A. Intra-articular corticosteroid injection vs. suprascapular nerve block for adhesive capsulitis: a systematic review and meta-analysis of level I randomized controlled trials. Journal of Shoulder and Elbow Surgery, 2025; 35, e402-e415. DOI: 10.1016/j.jse.2025.05.037 External Link
4. Swaroop S, Gupta P, Patnaik S, Reddy SS. Intra-articular Steroid alone vs Hydrodilatation with intra-articular Steroid in Frozen Shoulder - A Randomised Control Trial. Malays Orthop J. 2023 Mar;17(1):34-39. doi: 10.5704/MOJ.2303.005. PMID: 37064640
5. Hanish SJ, Resnick ML, Kim HM, Smith MJ. Predictive Factors for Failure of Intraarticular Injection in Management of Adhesive Capsulitis of the Shoulder. J Clin Med. 2022 Oct 21;11(20):6212. doi: 10.3390/jcm11206212. PMID: 36294535
6. Shang X, Zhang Z, Pan X, Li J, Li Q. Intra-Articular versus Subacromial Corticosteroid Injection for the Treatment of Adhesive Capsulitis: A Meta-Analysis and Systematic Review. Biomed Res Int. 2019 Oct 15;2019:1274790. doi: 10.1155/2019/1274790. PMID: 31737653
7. Rawat, S. S. & None, V. M. (2025). Efficacy of Intra-Articular Corticosteroid Injection in the Management of Idiopathic Frozen Shoulder. Journal of Contemporary Clinical Practice, 11(11), 8-13.
8. Chan JM et al. Intra-articular Corticosteroid Injection for Adhesive Capsulitis: A Randomized Controlled Trial. The Open Orthopaedics Journal. 2024; 18(1). DOI:10.2174/0118743250330711240916064941
9. Challoumas D, Biddle M, McLean M, Millar NL. Comparison of Treatments for Frozen Shoulder: A Systematic Review and Meta-analysis. JAMA Netw Open. 2020 Dec 1;3(12):e2029581. doi: 10.1001/jamanetworkopen.2020.29581. PMID: 33326025
10. Sıvacıoğlu S, Tunalı O, Çetin O, Atalar AC. Simultaneous arthroscopic treatment of adhesive capsulitis and rotator cuff tear: a retrospective analysis of clinical outcomes. Acta Orthop Traumatol Turc. 2025 Sep 12;59(5):265-267. doi: 10.5152/j.aott.2025.25441. PMID: 40995665
11. Elango Y, S A, Swaminathan S, et al. Comparison of the analgesic efficacy of intra-articular steroid injections and its combination with suprascapular nerve block for adhesive capsulitis of the shoulder joint: a randomized clinical trial. Regional Anesthesia & Pain Medicine Published Online First: 20 December 2024. doi: 10.1136/rapm-2024-105902

12. Romeo PV, Papalia AG, Alben MG, Gambhir N, Shankar D, Bi AS, Zuckerman JD, Virk MS. Prognostic factors associated with improvements in patient-reported outcomes in idiopathic adhesive capsulitis. JSES Int. 2022 Dec 20;7(2):336-341. doi: 10.1016/j.jseint.2022.12.007. PMID: 36911781
13. Hill JL. Evidence for Combining Conservative Treatments for Adhesive Capsulitis. Ochsner J. 2024 Spring;24(1):47-52. doi: 10.31486/toj.23.0128. PMID: 38510216.